A STUDY OF VIETNAM VETERANS' MENTAL HEALTH AND HEALTHCARE CONSUMPTION

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STATEMENT OF CANDIDATE'S CONTRIBUTION TO THE RESEARCH

The research reported in this thesis was initiated in a proposal to the NHMRC Psychiatric Epidemiology Research Centre and developed by the candidate in consultation with the supervisors and advisors. The thesis research represents an extension of the Australian Vietnam Veterans Health Study (AVVHS) in which the candidate was a principal investigator. Supplementary analyses and new data were added to those available from the AVVHS to complete this research.

As National Director of the Vietnam Veterans Counselling Service (VVCS), the candidate supervised and managed the work of the VVCS counsellors conducting 320 of the 641 AVVHS interviews. He also personally conducted 40 interviews. As a Principal Investigator for the AVVHS and co-grantee of the NHMRC and PHRDC study grants, the candidate contributed to the design, implementation and management of the AVVHS project.

In producing this thesis report, the candidate drafted chapters 1, 2, 4, 5, 6, 7 and 8 independently and revised them after review by supervisors and advisors. Chapter 3 was the result of collaborative research on which the candidate was a chief investigator and author.

Professor Henderson supervised the development of the thesis research and provided comment at seminar presentation on each chapter. He also provided overall supervision on progress with the thesis research and guidance on its scope. Professor McFarlane provided several consultations on particular content areas of the thesis research and

comments on the reports produced. Chapters 4, 5 and 6 are the result of analyses carried out by the candidate under advice and supervision of Dr DA Grayson and Professor AF Jorm. Dr Grayson provided tutorial sessions and advice in the statistical techniques used. Professor Jorm and Professor Henderson provided regular supervisory sessions and comment on drafts of chapters and papers.

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The energy and commitment of Dr BI O'Toole, Dr DA Grayson, Dr R Schureck, Dr M Dobson and the other research associates involved in the Australian Vietnam Veterans Health Study (AVVHS) (1989-1993) were vital to the achievement of the research on which this thesis research built. Further details of the background and support for the AVVHS are provided at Appendix 1. The helpful comments of work and professional colleagues on concepts and drafts were appreciated, as were those from the reviewers of various articles submitted for publication from the project.

Most importantly I thank my wife and sons who patiently waited round while I worked on the thesis research and helped with constant encouragement and frequent reality checks.

LIST OF ABBREVIATIONS

Abbrev	Meaning
ABS	Australian Bureau of Statistics
AGC	Australian Army General Classification Test
AIHW	Australian Institute of Health and Welfare
AN-DRG	Australian National Diagnosis-related Groups
ANU	Australian National University
AUSCID	Australian adaptation of the Spitzer Structured Clinical Interview for DSM-III-R, version NP-V
AVVHS	Australian Vietnam Veterans Health Study
CATI	Computer-assisted Telephone Interview
CDC	American Centres for Disease Control
CES-D	the Centre for Epidemiologic Studies - Depression Scale
CI	Confidence Interval
DAS	Spanier Dyadic Adjustment Scale
DSM3	Diagnostic and Statistical Manual of the American Psychiatric Association 3rd edition
DSM4	Diagnostic and Statistical Manual of the American Psychiatric Association 4th edition
DVA	Department of Veterans' Affairs
GHQ	The 28 item General Health Questionnaire (Goldberg, 1978)
HIC	Health Insurance Commission
ICD9	International Classification of Disease - version 9 (World Health Organisation)
IQ	Intelligence Quotient
NHMRC	National Health and Medical Research Council
NHS89/90	National Health Survey 1989/90
NVVRS	National Vietnam Veterans Readjustment Study
PHRDC	Public Health Research and Development Committee
POWs	Prisoners of War
PTSD	Post-traumatic stress disorder
RR	Risk Ratio
RSL	Returned and Services League of Australia
SDI	The Army Self Description Inventory
STAI	Spielberger Trait Anxiety Inventory
VVAA	Vietnam Veterans Association of Australia
VVCS	Vietnam Veterans Counselling Service
WWII	World War 2

THESIS ABSTRACT

Following the Vietnam War, the condition of post-traumatic stress disorder (PTSD) was identified as a particular problem among veterans and research on the topic expanded dramatically. This has drawn attention to the issue of healthcare consumption patterns of veterans with PTSD and related problems. In generalising from studies on veterans, we need to examine whether veterans are higher consumers of healthcare than the rest of the community once health status is controlled. Use of self-report data by most studies on these topics also raises the issue of the validity and reliability of self-report measures of healthcare consumption.

To examine these issues, this thesis research used data on 74 predictor variables and self-reported healthcare consumption from the Australian Vietnam Veterans Health Study (an epidemiological study of 641 Vietnam veterans). These were supplemented with community data from the Australian Bureau of Statistics National Health Survey (11,468 age and sex matched general community peers). Administrative data on medical care utilisation of the 641 study subjects were also obtained from the Department of Veterans' Affairs and the Health Insurance Commission

Self-reported health status of Australian Vietnam veterans was first investigated. Veterans reported greater health service usage and more recent healthcare consumption than men did of the same age in the community. However, when age and diagnoses were controlled, veterans did not consume any more health services than community controls. Combat exposure was associated with significantly increased reports of only some health

problems so there did not appear to be a general disposition to complain as a result of health problems due to combat.

The relationship between healthcare consumption and 74 predictor variables was then examined. A series of regression models grouped the variables into blocks labeled age, physical and mental health, predisposition, deployment experiences and repatriation. The presence of a diagnosis of PTSD was associated with an additional cost of $102 per fortnight in self-reported healthcare consumption. This effect was reduced once physical health was controlled. Each physical diagnosis was associated with an average cost of $35. Alcohol consumption was found to be unrelated to healthcare consumption. Other variables associated with healthcare consumption were general mental health status, particularly depression, educational status and the quality of the veterans' social supports during and after deployment. Similar results were found for predictors of actual medical care utilisation costs.

Veterans' self-reports were found to be a valid measure of relative medical care consumption because those who reported care over the past two weeks were much more likely to have been recent consumers than those who did not. However, the HIC and DVA data confirmed only 51% of veterans' self-reporting medical care consumption during the past two weeks as having actually received them in that period. While those subjects who were actually provided with two or more services in the two-week self-report period substantially under-reported their medical care consumption, a net over-estimate of 30% was produced by the self-report data.

VALUE OF THE FINDINGS

The findings of this thesis study should have most value in two areas:

- Those planning healthcare programs for PTSD and mental health problems associated with traumatic events and occupations will find value in the identification of the healthcare costs of PTSD and related mental health problems. This will enable more informed business analysis to be made of the value, need for and impact of such programs.
- Those using survey results to estimate healthcare consumption costs can use these findings to add confidence to their use of self-report data and add precision to estimates of actual costs. The analyses in this thesis give a basis for developing techniques to adjust for over-reporting in low users and under-reporting in high users of healthcare services.

1 CHAPTER 1: VETERANS WITH PTSD AND THE HEALTHCARE SYSTEM –

"..the term 'post-traumatic stress disorder' springs from the pages of the DSM-III like some newly found tropical flower, previously undescribed, yet clearly present in its full-blooded maturity for every onlooker to see." (Trimble, 1985)

1.1 CHAPTER 1 ABSTRACT

After almost every deployment of military personnel to combat roles, investigations have been conducted on the effects of war service on military personnel. Judicial inquiries, parliamentary committees, and popular opinion as expressed in the media and literature have reported elevated levels of health problems and healthcare consumption. These reports have usually been followed and verified by epidemiological research. Following the Vietnam War, the condition of post-traumatic stress disorder (PTSD) was identified as a particular problem among veterans and research on the topic expanded dramatically. Identifying the social and healthcare dimensions of PTSD has led to the need to plan appropriate and effective responses and identify the costs.

There is also a need to identify the social and other-than-health factors that may also contribute to healthcare consumption in the presence of PTSD. A related issue is whether veterans are higher consumers of healthcare than the rest of the community once their poorer health is controlled. Using epidemiological techniques and self-report data requires examination of the validity and reliability of self-report measures of both health status and healthcare consumption. There was an opportunity to examine these issues through involvement in a major epidemiological study of the health of a large sample of veterans. Social and behavioral predictors of healthcare consumption including PTSD were examined as the topic of this thesis. Data from the epidemiological study were used. They were supplemented with Australian Bureau of Statistics population survey data and health service utilisation data extracted from Health Insurance Commission and Department of Veterans Affairs records. The sequence of bringing the data from the various sources together to examine the issues investigated by the thesis research is shown in Table 1.1.

1.2 INTRODUCTION

The effects of war service have been studied on soldiers of successive generations. They have been examined from many points of view. A number of researchers examining the effects of war service have studied the direct and indirect healthcare costs of mental and physical illness (Fontana & Rosenheck, 1997; Rosenheck, Gallup, & Frisman, 1993). Others have studied loss of productive workforce and income during and after the deployment, opportunities lost by those deployed, family and social dysfunction and resulting developmental and educational deficits (Loretti, 1997; Murray & Lopez, 1997).

These latter costs may be balanced marginally by the gains in skill and coping strategies learned by participants during deployment. There are also gains in skills and coping abilities of those who were left to pick up additional roles and functions at home (Giblett, 1987). Nevertheless, among the most obvious costs of deployment are those related to healthcare. These costs can continue for many years afterwards and, in some cases, for the entire life of the veteran and family concerned (Archibald & Tuddenham, 1965; Burges-Watson, 1993).

The Vietnam War has provided particular incentives to examine these costs because of contention over whether external powers such as USA and Australia should have become and remained involved (Day, 1986; Renouf, 1979). These discussions often included reference to the direct costs of involvement as measured by costs of wages and equipment. These costs, for Australia between 1962 and 1973, have been officially acknowledged as $AUD218.4 million. Unofficially they have been estimated at up to $AUD500 million. Some authors acknowledge that this does not account for the unknown post war cost of the deployment to the veterans, their families and the community (Rubens, 1999).

This thesis research investigates one of these costs; the cost of health services consumed as related to the veterans' deployment. It also compares two different means of measuring the healthcare costs and provides important information on the validity of self-report as a measure of actual healthcare consumption.

From the early 1980s, after a period of neglect by the community, Australian Vietnam veterans began to receive increasing attention both from the community, as reflected in the media, (see Figure 1.1) and from the Department of Veterans' Affairs as the

responsible administrative arm of the Government. Some major milestones in the growth of attention to their needs and health problems were the Senate Inquiry into Pesticides in Vietnam (Senate Standing Committee on Science and the Environment, 1982), The Royal Commission on the Use and Effects of Chemical Agents on Australian Personnel in Vietnam (1985), and the Inquiry into Counselling and Ancillary Services for Vietnam Veterans by the House of Representatives Standing Committee on Community Affairs (1988a).

Figure 1.1 Media portrayal of Vietnam veterans as a problem group

These Inquiries and other community discussion of the needs of Vietnam veterans as a special group with particular problems, led to questions about the level of veterans' needs as compared to the general community and also to how well their needs were being met. A special study group, which was set up in the Australian Institute of Health, canvassed methods of examining these questions. This group produced reports on issues such as the mortality effects associated with exposure to herbicides (Fett, Dunn, Adena, O'Toole, &

Forcier, 1984; Fett, Nairn, & Cobbin, 1987; Forcier, Hudson, & Fett, 1984; O'Toole, Adena, & Fett, 1984). They also recommended a further major epidemiological study into the health of veterans (O'Toole, 1983). However, the Government did not accept this recommendation.

An important acknowledgement by the Government of the special needs of Vietnam veterans came in 1982 with the establishment of the Vietnam Veterans Counselling Service (VVCS), which was set up to assist Vietnam veterans and their families with their health and social problems. The VVCS quickly found itself regarded as a lead agency in developing community and therapeutic interventions in response to the high levels of PTSD in its clients, as well as acting as a general counselling, referral and advocacy service (Marshall, 1987). It also found itself having to take on a community information role about the special needs of the returning war veterans and their families (Marshall, 1984).

Although the Government did not accept the recommendation made in 1983 to set up an epidemiological study, several people were convinced of the need for such a study. The Australian Vietnam Veterans Health Study (AVVHS) resulted from a private initiative of the principal investigators. It was initially supported by a research grant from the National Health and Medical Research Council (NHMRC). Once established, the study obtained further funding support from the NHMRC, Public Health Research and Development Committee, the Australian Vietnam War Veterans Trust Ltd., the Department of Veterans' Affairs, the Westmead Research Institute and the Australian War Memorial (O'Toole et al., 1996a; O'Toole et al., 1996b; O'Toole et al., 1996c). It was this study that provided the core epidemiological data used in this thesis research

after supplementation with unit record data from the Australian Bureau of Statistics National Health Survey 1989/90 and with Health Insurance Commission data on medical care consumption.

1.3 BACKGROUND TO THE THESIS RESEARCH

1.3.1 CONTEXT OF THE THESIS RESEARCH

This thesis research constitutes an extension of the AVVHS, which was an epidemiological study of the physical and mental health of Australian Vietnam veterans. Some similar studies that had been conducted previously with American veterans found that veterans were suffering high rates of various health problems (Centers for Disease Control, 1988d; Jordan et al., 1991; Kulka et al., 1990b; Kulka et al., 1991).

At the time the AVVHS was designed, in the late 1980s, there was considerable community acceptance that Vietnam veterans had special needs. This was generally attributed to the special circumstance of their war service. These included not only the difficult deployment circumstances but also the ambivalent community attitudes to the war and the veterans who had fought there (House of Representatives Standing Committee on Community Affairs, 1988a; Royal Commission on the Use and Effects of Chemical Agents on Australian Personnel in Vietnam, 1985; Waterhouse, Cosgrove, O'Toole, Simpson, & Spragg, 1985).

After six years of operation by the Vietnam Veterans' Counselling Service there were continued claims that the help available to veterans and their families remained inadequate. Others questioned whether veterans should be singled out rather than make

use of 'mainstream' services (House of Representatives Standing Committee on Community Affairs, 1988b).

While veterans' entitlement to appropriate care was rarely an issue, some opinion questioned the need for special services (Baume, Bomball, & Layton, 1994). In successive reviews of the effectiveness of the VVCS, it was often suggested that the service should be cost efficient because it would reduce the use of other healthcare services by veterans (Waterhouse et al., 1985). The corollary to this is that people who have used the VVCS should, if it had been effective, consume less healthcare after counselling than before or at least consume less other healthcare while they were using it. An evaluation of the VVCS attempted to measure such effects using a self-report questionnaire (Waterhouse et al., 1985). However, in the light of contradictory findings, it was acknowledged that a specific *role* of the VVCS was to refer and advocate for access to appropriate healthcare. Hence the effectiveness of VVCS, as a low cost healthcare alternative, and its effectiveness as a referral and advocacy service logically would have opposite effects on a simple measure of change in healthcare consumption. Veterans might be using less healthcare services than if the VVCS was not there but still need more healthcare.

1.4 PTSD IN VETERANS AS A COMMUNITY RESPONSIBILITY

Service in war zones is known to be associated with elevated levels of morbidity in the veterans of those deployments (Kulka et al., 1990b; O'Toole et al., 1996c). In Vietnam veterans, post-traumatic stress disorder (PTSD) has been a particular focus of attention because it is a directly identified risk of combat exposure (American Psychiatric Association, 1994; Van Putten & Emory, 1973). While these morbidity effects have been

identified in many studies, there has been little systematic work to identify the healthcare costs of war service. In Australia, successive governments have acknowledged the special health needs of veterans by providing designated healthcare entitlements for veterans of war and other operational defence deployments (Baume et al., 1994). However, these benefits do not represent the actual cost of healthcare associated with the deployment, as the entitlements may include other healthcare costs and exclude some that are associated with deployment. Some veterans are entitled to receive all their healthcare from the services funded by the Department of Veterans' Affairs while others have only partial or no entitlement.

One of the conditions that appear more frequently in Vietnam veterans than the remainder of the community is PTSD (Commonwealth Department of Veterans Affairs, 1998). This condition can be directly linked to veterans' service when the causal event (Criterion A) is identified as a traumatic experience or critical incident that occurred during the veteran's deployment. Because of this, compensation and care for the resulting disability is even more clearly a community responsibility than it is in the case of illnesses less directly related. For this reason, PTSD was chosen as a special focus for this thesis research, particularly in light of the fact that little had been previously available on the cost of care for this relatively recently defined but well recognised disorder (American Psychiatric Association, 1994).

Study of war-related mental health problems has expanded dramatically in recent years. Limited attention was given to deployment-related stress reactions prior to the definition of PTSD in the Diagnostic and Statistical Manual 3rd edition (DSM3) and the causality was often attributed to aspects of service other than stress. Between 1900 and 1980

PTSD-type symptoms received limited investigation under various conceptualisations. Terms used included mental injuries, shell shock, war neuroses, traumatic and emotional psychoses, war-time nerves, functional nerve disease, conversion hysteria, soldier's heart, effort syndrome, shell concussion, traumatophobia, predisposition to psychiatric disorders, inadequate personality, acute stress disorder, reactive depression, delayed combat reactions, operational fatigue, battle neurosis, postwar traumatic neurosis, combat exhaustion, neurocirculatory asthenia, anxiety neurosis, neurasthenia, traumatic over-stimulation, gross stress reaction, post-traumatic neuroses, cumulative trauma, traumatic neurosis, acute traumatic syndrome, persistent stress reaction after combat, psychotraumatic reactions, conversion reactions and stress neuroses.

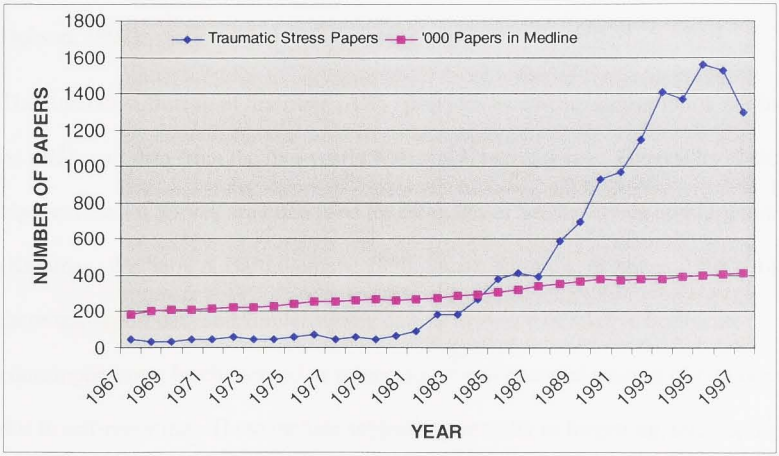

Figure 1.2. Growth of research interest in traumatic stress 1967 to 1997

In the seventy years between 1907 and 1977, 729 papers (10 per year) were published on these subjects. More recently, in the twenty years between 1977 and 1996, 12,314 papers

(616 per year) were published. The recent growth in interest in this topic in comparison to the general growth in health publications is shown in Figure 1.2.

1.5 HELP SEEKING AND HEALTHCARE CONSUMPTION

One indicator of 'access appropriate' healthcare services is the extent to which claims are lodged and accepted for entitlement to use special health services provided by the Department of Veterans' Affairs (DVA). However, as these services are unique to veterans, no comparative data are available to indicate whether the uptake is optimal. One means of assessing the adequacy of services being offered is comparison with community norms for service access and utilisation. This indicator was examined in a separate report emerging from this thesis research (Marshall, Grayson, Jorm, O'Toole, & Dobson, 1997).

The Australian Bureau of Statistics (ABS) provides healthcare consumption norms based on self-report data from the five-yearly National Health Survey. The results of the ABS National Health Survey are often used for estimates of health service consumption (Knuiman, Welborn, & Bartholomew, 1996; Stuart, Klimidis, & Minas, 1998). Use of these self-report data and similar survey data as evidence of relative healthcare consumption may be challenged as subject to several potential sources of bias or error due to self-reporting. These include subjects' propensity to forgetting, telescoping, misunderstanding of the question, exaggeration and minimisation.

A source of 'hard data' from actual event records therefore becomes desirable to identify these problems. In recent years, opportunities have arisen to obtain these data from medical service utilisation records maintained for health service benefits payments by the Health Insurance Commission. Work was pioneered in the extraction of medical care

utilisation records for use in epidemiological research by studies such as McCallum et al (1994a) and Korten et al (1998).

1.6 CASEMIX AND HEALTH SERVICE PLANNING AND EVALUATION

For the purpose of assessing health service consumption patterns and their costs, a widespread approach has been to classify health service utilisation to types of episode of care. This enables calculation of costs of particular service types and gives norms for provision levels in particular population groups. Allocation of funding levels is often based on those norms (Phelan, Tate, Webster, & Marshall, 1998).

In the case of a particular disorder like PTSD, the actual costs are often hidden in a larger category such as v3.1 AN-DRG 847 (Personality disorders and acute reactions) in the Australian casemix classification, which is used as the basis for acute health service funding (Duckett, 1998). The prevalence levels of such diagnoses are also often hidden within these groupings or by changes in data coding or editing standards. However, bearing these qualifications in mind, the reported growth in use of this diagnosis in Australia is indicated by Figure 1.3, which shows the growth of use of the PTSD diagnosis in Victorian hospital admissions over the past five years. This inevitably draws attention to the need to provide more adequate or appropriate healthcare resources for people so diagnosed.

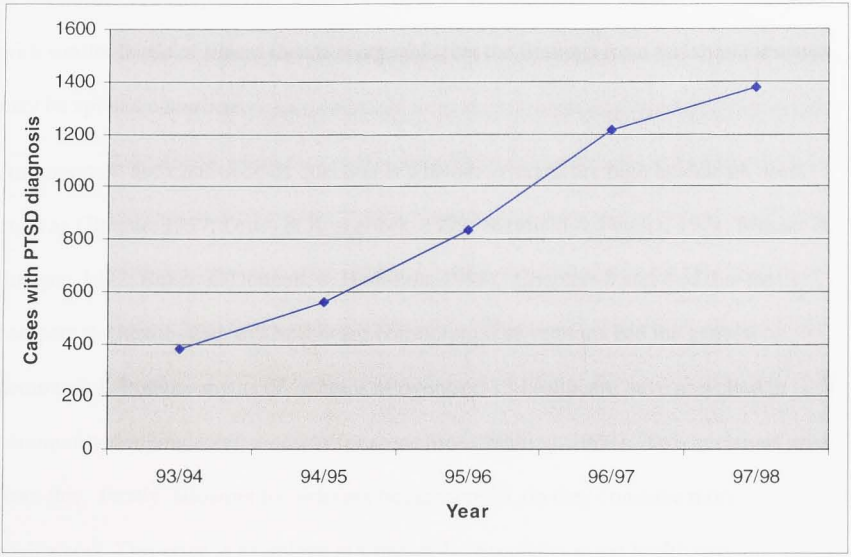

Figure 1.3. Patients with PTSD diagnosis in Victorian Hospitals 1993/4 – 1997/8

Data for Figure 1.3 were obtained from the Victorian Inpatient Minimum Datasets – 1993 –1998 – extracting cases with at least one ICD-9-CM diagnosis code for a traumatic-stress-related condition.

1.7 GENERALISING THE FINDINGS FROM VETERANS

This thesis research set out to produce information on the relationship of mental health and other factors to healthcare consumption in veterans. An important question, which then needs to be raised, is whether these findings can be generalised to the general population. If the findings can be validly generalised, the information would be of considerable value since the detailed data available for veterans are often not available for others in the community. To be able to generalise findings from these data on veterans, we need to be confident that costs identified as related to veterans' mental

health are not peculiar to veterans. If it can be established that veterans' general patterns of healthcare consumption are similar to those in members of the general community with similar levels of illness then it is arguable that the findings from this thesis research may be applied elsewhere.

An important and controversial question is whether veterans are high healthcare users anyway (Baume, 1997; Druss & Rosenheck, 1999; Mayfield & Fowler, 1971; Musser & Stenger, 1972; Reker, O'Donnell, & Hamilton, 1998). Chapters 3 and 4 of this thesis compare the health-state and healthcare consumption of veterans and the general community. Popular myths of veterans as overusers of healthcare have prevailed in community thinking about veterans for some time (Whiting, 1969). Two questions arise from this. Firstly, allowing for veterans being more ill, do they consume more healthcare? This issue is examined in Chapter 4. Secondly, is the healthcare consumption pattern related to mental health problems the same in veterans as in the general community? This is a more complex and difficult question to answer and is outside the scope of this thesis research. However, the comparisons between veterans and the general population in Chapters 3 and 4 give some preliminary pointers for further examination of this issue.

This thesis research also focused on the veterans' deployment as a plausible source of influence for their healthcare consumption patterns. This was chosen for two reasons:

- Incidents during deployment were a likely reference point for PTSD. Thus it was important to be able to separate out the effect of the current PTSD from the effect of the deployment.

- A military deployment is a major life event by anyone's standards. For each of the subjects in this group, their Vietnam deployment was at least 20 years before the interview date. It was therefore a useful example to test the techniques for measuring potential effects of distant life events on healthcare consumption generally.

1.8 THE QUESTION

The core question to be examined in this thesis is how much are mental health problems, particularly PTSD, in veterans costing the community in healthcare consumption?

1.8.1 ISSUES ARISING FROM THE QUESTION

This question has to be answered in the context of the general health of the population examined. Measuring the impact of PTSD with and without treatment interventions provides an opportunity to evaluate the effectiveness of PTSD treatment programs. However, in considering the impact of PTSD it is important to recognise that healthcare consumption is only one of those impacts (Donaldson, 1990). There are others that will not be examined here. They relate to quality of life and economic impact on the person with the disorder, their family and the community (Marshall & Dobson, 1996).

Apart from the higher levels of physical illnesses that occur in veterans, various physical and mental health problems tend to occur with PTSD (Burges-Watson, Muller, Jones, & Bradley, 1993b; Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995). These and many other factors may also be independently related to healthcare consumption. Some selected health problems, on which data were available, are examined with PTSD in Chapters 5 and 6. Non health (psychosocial) factors may also influence healthcare consumption. Some of these are associated with the exposure of the veteran to risk

factors for PTSD and other health problems – for example, their deployment circumstances and predisposing characteristics. These are also included in the analyses in Chapters 5 and 6.

1.9 SELF-REPORT VS. ACTUAL MEASURES

A convenient approach to estimating the full cost of healthcare consumption is to use self-report data to examine healthcare consumption in relation to various health and psychosocial factors (Australian Bureau of Statistics, 1991a; Marshall, Jorm, Grayson, & O'Toole, 1998b). Many studies in Australia draw on self-report data to produce estimates of both morbidity and service utilisation patterns (Knuiman et al., 1996; Stuart et al., 1998).

As mentioned above, when using self-report data to estimate costs, care needs to be taken in its interpretation. There are known problems such as forgetting and telescoping, which may produce recall bias, even when using a short reporting period. For this reason, data on actual medical care used were obtained from DVA/HIC and analysed as well. These data provided two opportunities:

- Firstly, the availability of utilisation data on **medical care consumption over a twelve-month period** for the study subjects enabled us to examine the relationship between medical service use and PTSD and other factors. (A parallel analysis to Chapter 5.) The results of the analysis are reported in Chapter 6.
- Secondly, by **validating self-reported medical care consumption over a two-week period** with the administrative records of actual medical care provided we were able to examine of the validity of the self-report measure. The only 'hard' healthcare data

available in a complete form covering the two-week self-report period were medical data. This subset of the 'hard' utilisation data needed to be extracted for comparison of self-report medical care consumption. The results of this analysis are in Chapter 7.

1.10 HYPOTHESES

Hypotheses examined in the thesis are that:

- PTSD is a major contributor to healthcare costs.
- Veterans are higher consumers of healthcare than are general community peers.
- Healthcare consumption is predominantly related to level of illness as measured by objective diagnoses.
- Self-report is a valid and reliable estimate of healthcare consumption.

Table 1.1 lays out the Chapter structure of the thesis, by which the above issues were examined. It also provides a summary of how the data available from the AVVHS study, and the ABS National Health Study were used and brought together with data extracted from the administrative databases of the HIC and DVA test the above hypotheses.

Table 1.1 Aims, data and analyses presented in thesis chapters.

	Aim	Contents
Chapter 1	Introduction	Introduction and background to the thesis research.
Chapter 2	Method	AVVHS survey data are linked to 12 months HIC and DVA utilisation data. A comparison is made of the use of Poisson and linear regression models for the analysis of such data
Chapter 3	Veterans morbidity by disease type	**AVVHS self-report data are combined with unit record data from the ABS-NHS dataset** to measure veterans' morbidity as compared to men of the same age group in the community.
Chapter 4	Comparative healthcare consumption veterans and community	**AVVHS self-report and ABS-NHS self-report data** are again combined to compare veterans' self-reported use of healthcare services with age-sex matched peers and with health state controlled.
Chapter 5	Predictors of healthcare consumption	A linear regression model is applied to AVVHS clinical history survey data and **self-reported healthcare consumption over 2 weeks** to identify factors associated with self-reported healthcare consumption in veterans. (Detailed clinical history survey data were available for these subjects that are not available in the ABS NHS data.)
Chapter 6	Predictors of medical care consumption	The same linear regression model used in Chapter 5 is applied to AVVHS clinical history survey data linked with **12 months HIC and DVA actual medical utilisation data**. This examines predictors of actual medical care utilisation over the longer period of 12 months. In doing this two concerns from Chapter 5 analyses are addressed – the short 2-week reporting period and the self-report nature of the data.
Chapter 7	Validity of self-reported medical care consumption	AVVHS **self-reported medical care consumption and actual medical care utilisation for the same 2-week period** as obtained from HIC and DVA data are compared. Bivariate correlation and chi-squared tests are used to validate the self-report data.
Chapter 8	Conclusions and comparison of self/report and utilisation data results.	AVVHS self-report linked with HIC and DVA utilisation data – main findings and conclusions are discussed.

Data from the AVVHS epidemiological survey, unit record data from the AVVHS National Health Survey 1998/99 which was in the field at the same time as the AVVHS and actual medical care utilisation data from DVA and HIC were brought together to provide information on these issues. How the data from the various sources were extracted, combined and analysed to address the issues raised in this discussion and resultant hypotheses is described in the next chapter of the thesis.

2 CHAPTER 2: METHOD – THE AUSTRALIAN VIETNAM VETERANS HEALTH STUDY AND SUPPLEMENTARY DATA ANALYSES IN THIS THESIS RESEARCH

"A dataset is not information

Information is not knowledge

Knowledge is not wisdom"

2.1 CHAPTER 2 ABSTRACT

The methodology of this thesis research built on earlier work investigating the health and social problems of Australian Vietnam veterans. Hypotheses to be investigated covered the relationship of post-traumatic stress disorder and other predictors with healthcare consumption. The validity of self-report measures of healthcare consumption was also investigated. Data were accessed from the Australian Vietnam Veterans Health Study (an epidemiological study of 641 Vietnam veterans). These were supplemented with community data from the Australian Bureau of Statistics National Health Survey (11,468 age and sex matched general community peers). Administrative data on medical care utilisation of the 641 study subjects were also obtained from the Department of Veterans' Affairs and the Health Insurance Commission. This chapter introduces the range of analytical techniques used in subsequent chapters.

The first of these techniques used was calculation of descriptive Relative Risk ratios and confidence intervals to compare the prevalence of particular health problems in veterans with the prevalence in the general population. A t-test comparison of means was used to analyse the relationship between combat exposure and the prevalence in veterans of particular health problems. Linear regression models were used in the analyses of predictor variables reported in Chapters 4, 5 & 6 to examine the relationship between various factors, such as age, veteran status and health, and the end point variables of total self-reported healthcare consumption (Chapters 4 & 5) and medical care utilisation (Chapter 6). Poisson regression models were also considered because of the skewed distribution of the healthcare consumption data. However, since the Poisson modeled values did not improve the fit, linear regression models were chosen to give relative simplicity in interpretation.

2.2 INTRODUCTION

In the previous chapter, the background to the hypotheses examined in the thesis was discussed. The hypotheses put forward for examination were:

- PTSD is a major contributor to healthcare costs.
- Veterans are higher consumers of healthcare than are general community peers.
- Healthcare consumption is predominantly related to level of illness as measured by objective diagnoses.
- Self-report is a valid and reliable estimate of healthcare consumption.

The methods for testing these hypotheses are to be discussed in this chapter.

The main consideration in the methodology for this thesis research was the complexity of the relationships between the variables. The ability to test the relationships between the variables is usually constrained by the available data. However, for this thesis research a massive database was available on each of the subjects, from the Australian Vietnam Veterans Health Study (AVVHS). This database included both current and historical clinical screening results. We were also able to retrieve supplementary record data on healthcare consumption to corroborate self-report measures obtained from the interviews.

The detailed report on the design and data content of the AVVHS is provided in the published report reproduced as Appendix 2.1.

2.2.1 COMPARISON OF PREVALENCE OF DIAGNOSES BY RELATIVE RISK RATIOS

Before examining healthcare consumption, it is useful to know whether veterans health-state is worse or better than their peers in the general community. Chapter 3 compares the health patterns of Vietnam veterans with that of the general population. We focus in that chapter on whether veterans are more at risk of reporting particular disease types than age/sex matched people in the general population. The chapter reports these risks broken down into 37 diagnostic categories, each of which is important in its own right in terms of having some potential for additional effort in health services interventions or investigation.

Because of the need for this level of detail in identifying the relative health status of veterans and community peers, each disease category was analysed separately and relative risk ratios with confidence intervals were used to report the comparisons. This is a readily understandable method of presentation when there is only one predictor variable

or category, which is of primary interest (veteran status), and there is a limited number of related variables which we want to control (age, sex). It produces a simple table, which shows the prevalence of the particular characteristic of interest (disease), and how the prevalence of that disease in veterans compares to its prevalence in the control group (men of similar ages in the general population). It also enables simple tabulation of confidence intervals within which the actual relative risk ratio is expected to lie.

2.2.2 MEASURING THE CONTRIBUTION OF PTSD TO HEALTHCARE COSTS

One pointer to whether **PTSD is a major contributor to healthcare costs** is to measure the extent to which the presence of PTSD and higher healthcare consumption coincide in individuals within populations. The survey data from the AVVHS included several measures of PTSD, including an Australian adaptation of the Spitzer Structured Clinical Interview for DSM-III-R, version NP-V (AUSCID) (O'Toole et al., 1996a). It also contained self-report measures of health service consumption. The availability of both of these data on each of the subjects allowed us to analyse this relationship and also contributions of other possible factors such as deployment circumstances and social support.

PTSD is only one of many mental-health and other factors that may be associated with a higher level of healthcare consumption. Therefore, its true relationship with healthcare consumption can only be fully understood when considered in the context of other factors that are also implicated in healthcare consumption. In an observational study such as the AVVHS, the most convenient means of controlling for the effects of other variables is to

fit them in a regression model to attempt to explain the relationships between all the predictor variables and healthcare consumption.

Regression models were used to examine the relationship between the predictor variables in the model and healthcare consumption levels. Linear regression also gives the opportunity to examine continuous variables such as healthcare consumption costs over a period of time.

In examining the relationship between combat exposure and the rate at which particular health problems were observed, four combat exposure categories were developed within the veteran cohort. This allowed a simple demonstration of the presence or absence of a relationship between higher levels of combat exposure and higher risk of particular health problems within the 37 ICD9 diagnostic categories. Statistical significance between these rates was estimated using a t test (on linear effect over the four exposure categories).

2.2.3 COMPARING VETERANS' HEALTHCARE CONSUMPTION WITH THAT OF GENERAL COMMUNITY PEERS

The 1989-90 ABS National Health Survey questionnaire was used for collecting data on the health of the veteran subjects (Australian Bureau of Statistics, 1991b). At the same time, it was in the field for the community ABS data collection. This provided the opportunity to compare the self-reported health of the veteran subjects with that of the general community.

Having the same set indicators of physical health and socio-demographic variables for both subject groups enabled comparison of relative health-state and age as potential

alternative explanatory variables for any difference in healthcare consumption patterns between the veteran subjects and community 'controls'.

2.2.4 HEALTHCARE CONSUMPTION AND LEVEL OF ILLNESS MEASURES

The purpose of diagnosis is to indicate the presence of a particular illness state. It is frequently proposed that the number of diagnoses is a useful proxy for the severity of illness (Iezzoni et al., 1990). Number of significant diagnoses and procedures has, for example, been proposed as a severity factor in funding formulae (Hindle, Degeling, & van der Wel, 1998).

Number of diagnoses has a number of shortcomings as a measure of severity of illness. One is its insensitivity to the difference in health state implication between diagnoses. For example, it could be said in criticism of this measure that one diagnosis such as lung cancer may be much more significant as an indicator of illness than another such as tonsillitis. It could also be said that, in some cases, two or three minor diagnoses might constitute a less severe health problem than one major diagnosis. However, the pragmatic response would be to point out that within each diagnosis is a range of severity levels almost as great as that between diagnoses. Moreover, a marginally more severe or complex level of illness is almost always implied by the addition of an extra diagnosis to an existing description. For this reason, the number of diagnoses self-reported by veterans was used as a proxy continuous measure of severity of illness (O'Toole et al., 1996a; O'Toole et al., 1996b; O'Toole et al., 1996c).

2.2.5 SELF-REPORT AS AN ESTIMATE OF HEALTHCARE CONSUMPTION

Self-report is the means of capturing information in many epidemiological studies and surveys (Australian Bureau of Statistics, 1991a; Card, 1983; Centers for Disease Control, 1988a; Centers for Disease Control, 1988b; Centers for Disease Control, 1988c; Centers for Disease Control, 1988d; Commonwealth Department of Veterans Affairs, 1998; Decoufle, Holmgreen, Boyle, & Stroup, 1992; Kulka et al., 1990b; Perconte & Wilson, 1994). However, it is often criticised as being inferior to third party observation or 'hard data' collection, because of a number of known recall biases and reporting characteristics that tend to occur with self-report (Bradburn, Rips, & Shevell, 1987; Brown, Rips, & Shevell, 1985; Eisenhower, Mathiowetz, & Morganstein, 1991; O'Toole et al., 1996a; Roberts, Bergstralh, Schmidt, & Jacobsen, 1996).

Moreover, without physical examinations it is difficult to know whether signs of disease can substantiate the excess reports of illness. The CDC study, which did include physical examination, (Centers for Disease Control, 1988d) found that Vietnam veterans self-reported more illness than their peers in a telephone interview, but that few differences were discernible on examination (Centers for Disease Control, 1988a). This does not necessarily mean that self-report is factitious, as diagnosis is not limited entirely to the presence of palpable signs. Indeed, in the survey context, under-reporting is usually presumed to be of more likely than over-reporting, with survey methodology often aimed at reducing undercounting. In previous studies of Australian Vietnam veterans, under-reporting of health problems when surveyed by mail, as well as over-reporting of health problems that required a diagnosis, was quite high when compared with medical record evidence (O'Toole, Battistutta, Long, & Crouch, 1986). Other recent research has

reported very high agreement between self-report and medical records of 91% for ambulatory physician visits in 2 weeks after reviewing complete community clinical records (Roberts et al., 1996).

In this thesis research, we had available both self-report and administrative record data for medical care utilisation. Self-report of medical care consumption for the two weeks before the interview was elicited in the health survey part of the interview. Records of payments for medical services were obtained from both the Department of Veterans (DVA) Affairs and the Health Insurance Commission (HIC).

These two measures of medical care consumption allowed us to directly compare self-report with 'actual' medical care consumption. This comparison gave a measure of the accuracy of self-report.

In addition to the issues of self-report validity, this thesis research also had to accommodate a number of methodological limitations common to all epidemiological field investigations. Three major hazards to inference in observational studies are selection, measurement and confounding errors. Selection errors were addressed when calculating odds ratios by adjustment for non-response using military data available for the cohort. This produced little change in estimates, giving confidence in the representativeness of the sample. Measurement issues were addressed procedurally; the ABS interviews, manual, coding materials and computerised data were used, although interviewer characteristics and training were undoubtedly different. The effect of clinical and academic interviewers compared with ABS lay interviewers, particularly as these may interact with veteran status, was examined and different symptom detection rates between interviewers of different backgrounds was observed amongst the AVVHS study

interviewers (Grayson et al., 1996). However, the net effect of any interviewing bias in surveys such as this one remains difficult to estimate. Confounding errors were minimised by the measurement and analysis of the large range of variables potentially related to healthcare consumption. This provided the capacity to identify and understand their relationship both individually and when combined as suggested by the model.

By fitting the variables in the order chosen according to the hypotheses to be tested (See Table 2.1 below) the effects of the variables of interest could be assessed when variables known to have similar effects on healthcare consumption were controlled. In the case of PTSD, it was accepted that a high degree of comorbidity exists with other mental health conditions. This is further discussed in Chapters 5 and 6. It was also acknowledged that many of the factors examined as part of the Repatriation experience would logically co-vary with PTSD: eg people with PTSD would be more likely to be sensitive to their veteran status being raised and would be more likely to think about Vietnam. Nevertheless, the univariate effects identified for PTSD remain as validly attributable to the veterans' Vietnam experience as the direct PTSD symptoms. Co-variates with PTSD may include effects related to predisposition, repatriation and exservice membership. While they are of general interest, the causal pathways, by which these other blocks of factors relate to costs associated with PTSD, do not weaken the observed relationship between PTSD and the cost of healthcare associated with it.

2.3 PROCEDURE

2.3.1 SUBJECTS

The Subjects examined in this thesis research were 641 Vietnam veterans interviewed from a random sample of 1000 veterans. The sample was drawn from the service records of the 50,000 Australian veterans who served in the Vietnam War. A sample of 2000 was first drawn from the service records and then randomly halved to produce the sample of 1000 to be contacted for interview. The parent sample of 2000 was used in matching and extraction of data from Army, DVA and HIC records. This provided an additional level of privacy for the 1000 subjects selected for interview and also the capacity to analyse results of data matching and extraction over a larger pool of subjects.

Of the 1000 subjects sampled for interview, 213 could not be found, 50 were known to have died, 61 refused interview, and 35 were unable to be interviewed in the time available (O'Toole et al., 1996a). This gives a response rate of 67% based on a sample of 950 living veterans or 91% of the living veterans who could be located.

For the measures of self-reported healthcare consumption and level of physical illness, community control subject data were available from the Australian Bureau of Statistics (ABS) 1989/90 National Health Survey (Australian Bureau of Statistics, 1991b). Interviewing for the National Health Survey was in progress at the same time as interviews for this thesis research, which used the same questionnaire, manual and interviewer training. This provided a massive community 'control group' of 11,468 subjects in the same sex and age categories as the veterans in this thesis research.

2.3.2 DATA

The AVVHS data used in the analyses for the veteran subjects came from health and psychological state questionnaires. These were supplemented with Army personnel and psychological records that dated back to before the subjects' enlistment into the Defence Force.

As a more objective measure of medical care consumption, administrative data on the services used by the subjects around the time of the interviews were extracted by DVA and HIC as described in Chapter 6.

2.3.3 PREDICTOR VARIABLES

Predictor variables were examined in six blocks of related measures. Variables were grouped into the six blocks on the basis of their relationship to the model described by the hypotheses.

These blocks of variables are listed in full in Appendix 2.1. A brief summary of the constructs represented by each block of variables follows:

1. **Age** (measured in five-year steps) at time of interview was included as a predictor factor within the model, because age is a known predictor of health service use (Hibbard & Pope, 1986; Kouzis & Eaton, 1998; McCallum et al., 1994a).

2. **Physical health** (2 variables used, which were subcategories of a total variable) was indicated by the number of diagnoses reported in the ABS survey, excluding mental health conditions. Diagnoses were divided between two variables, conditions that are

known to occur more frequently in veterans and those that do not (O'Toole et al., 1996b).

3. **Mental health** (6 variables used from 15 examined) was measured by: a detailed clinical interview to diagnose PTSD cases (Spitzer, Williams, & Gibbon, 1987), adapted for use with Australian veterans (AUSCID-V) (O'Toole et al., 1996a); the National Institute of Health Diagnostic Interview Schedule (Robins, Helzer, Hesselbrook, & Wish, 1981); and self completion questionnaires including the Mississippi PTSD scale (Keane, Caddell, & Taylor, 1988); the 28 item General Health Questionnaire (Goldberg, 1978); the Army Self Description Inventory (SDI) (Miles, Wilkes, Lester, & Hutchins, 1946); the Centre for Epidemiologic Studies - Depression Scale (CES-D) (Radloff, 1977); the Spielberger Trait Anxiety Inventory (Spielberger, 1979) and the Spanier Dyadic Adjustment Scale (Spanier, 1976). Six of the fifteen variables examined from these measures were selected as of particular interest in relation to use of healthcare services. These were used for construction of the final regression model.

4. **Predisposition** (10 variables used of 22 examined) or pre-existing risk indicator variables included:

   - personality attributes and attitudes prior and during the veteran's deployment which could make them vulnerable to stress related disorder or physical injury;
   - a propensity to hypochondria in their response to stressful experiences and symptoms, or an aggressive attitude that they are owed support by the community; and

- interpersonal or social circumstances that could add to the stress of deployment or reduce their coping resources.
- Demographic and historical health and psychosocial data were obtained from Army health and personnel records. Self completed questionnaires provided retrospective information on military service experiences and post-service adjustment issues.

5. **Deployment** (5 variables used of 14 examined) encompasses variables describing the sorts of exposure to health risks the soldier had leading up to and during their deployment and how they reacted to those experiences. Combat exposure was measured with a 21 item questionnaire developed by Wilson and Krauss (1985), administered during the AUSCID interview.

6. Repatriation (9 variables used of 14 examined) related to the quality of the veterans' homecoming and repatriation after their deployment. It included variables relating to the veterans' attitudes and adjustment during repatriation. These factors are measured by subjects' self-report of:

- how well they were supported and received;
- opportunities that they had to readjust; and
- whether they saw their deployment as having been a positive contributor to their personal status and achievements.

7 **Exservice involvement** (4 variables of 5 examined) is similar in concept to the sixth block in that it has some bearing on the veterans' sense of positive identity. It includes membership of exservice associations and involvement

with other veterans. This is often suggested as being a major contributor to people's healthcare consumption through additional use of DVA services. The DVA, for example, has traditionally had a close relationship with the Returned and Services League (RSL) in its outreach endeavours and exservice organisations are major providers of veterans' advocacy.

Of the above 74 variables listed in Appendix 2.2, 37 were omitted from the model to minimise collinearity between variables used or because they were actual linear functions of other variables which were included. Where collinearity was found, the variable to be retained was selected so that each of the factors relevant to healthcare consumption was covered as far as possible by only one measure. After the variables were culled to reduce collinearity, the number of variables left in the seven blocks were Age (1), Physical Health (2), Mental Health (6), Predisposition (10), Deployment (5), Repatriation (9) and Exservice Involvement (4).

2.3.4 DEPENDENT VARIABLES

2.3.4.1 Self-report of total healthcare consumption

This covered the two weeks immediately before the interview and included hospital admitted care, medical consultations, allied health consultations, drug consumption, hospital outpatient services, dental care, vitamin consumption. This two-week reporting period was chosen by the ABS because it was considered sufficient time to have an acceptable quantum of total healthcare consumption in a large sample of subjects but short enough to expect reasonable accuracy of recall. Questions eliciting these data were

prefaced with the phrase "In the past two weeks....". The questionnaire is attached as Appendix 2.3.

The responses obtained for numbers of each healthcare type were multiplied by the cost of the healthcare concerned, as obtained from price schedules where available, or from average published costs where no price schedule was available. These values are provided in Appendix 2.4. The sum of these values produced a total estimated cost of the self-reported healthcare consumption for the two-week period.

2.3.4.2 *Medical care utilisation*

Two alternative measures of medical care utilisation were produced from administrative data sets. The first was for medical service utilisation over a twelve-month period from six months before to six months after each subject's interview. The second covered the two weeks immediately before the interview and coincided with the self-report reference period.

HIC and DVA extracted the health service consumption data according to a protocol, which involved privacy protection and maintaining de-identified linked data as the final product of the matching and extraction algorithm. Both authorities were provided with a list of 2000 subjects' names and dates of birth linked to a randomly assigned Unit Record Number.

Three steps were taken to ensure privacy of the subjects during the data linkage. Firstly, the 641 interviewed subjects were not distinguishable in the sample of 2000 subjects provided to DVA and HIC. Secondly, the subject index file, which linked the linkage unit record number with the study subject number, was secured apart from the interview

data. Thirdly, the study subject number was substituted for the linkage unit record number before the match-extracted data from HIC and DVA were joined to the interview data. In this way, neither the subject names nor the Unit Record Number used for DVA and HIC data extraction were recorded in files containing the thesis research survey and demographic data.

DVA and HIC extracted data for the four-year period surrounding the two years of data collection after probabilistic matching of the subjects with the agencies' Client Master Indexes. Following data extraction, all records of medical service utilisation were compiled into a file that was provided to the study investigators with subjects identified only by the randomly assigned unit record number. Once the benefits data were returned to the study investigators, a further substitution process was undertaken which replaced the unit record number with the study subject number. The data returned from the HIC were then separately archived before aggregation of the records by subject number, and linkage to the survey and demographics variables. Approval for this process was obtained from the ANU Ethics Committee, the DVA Ethics Committee and the Ministerial Delegate of the HIC after fully specifying and explaining the privacy protection methods to be employed.

DVA data variables were mapped to the HIC format and the records were combined into an aggregated data set. The merged data set was then examined for duplicate records to ensure there was no overlap between the benefits paid by DVA and those paid by HIC. No overlap was found. The next step was to remove benefits paid by DVA for other than medical services so that uniform data for only medical services was retained without

confounding by inclusion of other services paid by DVA such as hospital, allied health, and some paramedical services.

Data were then summarised by totaling benefits paid by subject during the twelve-month period covering six months before and after each subject's interview date. The constructed variable of twelve-months medical benefits paid for each subject was then merged through a subject number link with the independent variable file to be used for the regression analyses in this thesis research.

2.4 RETRIEVAL OF ADMINISTRATIVE MEDICAL-CARE CONSUMPTION DATA

2.4.1 HIC MATCHING

Medicare benefits paid were found for 90% of the subjects in the four-year envelope around the interviewing period. For an age/sex group that tends to low use of healthcare, this indicates a highly successful match extraction. It is reasonable to expect up to 10% to be non-users of Medicare funded services, particularly considering that a number would be exclusive users of DVA funded services.

2.4.2 DVA MATCHING

Records of benefits paid were found for 35% of the subjects in the four years around the interviewing period. This is consistent with the number of veterans who are currently eligible beneficiaries of DVA. At 1 Jan 1997, Vietnam Veterans with disability pensions numbered 14,739 (29%), and, of all Australian Vietnam veterans, 8,908 (18%) had service pensions (Department-of-Veterans'-Affairs, 1998). (See also (Repatriation-Commission, 1992).) Either category of pension would entitle the veteran to use DVA

healthcare services but there would be a substantial overlap between these subpopulations (about 8000 (Department-of-Veterans'-Affairs, 1997)). However, a small additional group of veterans would be entitled to healthcare for some health problems but not to a pension. Given these exclusions and additions, 35% of the population making some use of DVA treatment services over a four-year period appears a reasonable representation of treatment of entitled veterans.

2.5 COMBINED MATCH RESULTS

When the matching results for both HIC and DVA benefits were combined, a data set of 55,309 records was produced for the parent sample of 2000 subjects for the four-year period. This contained an average of 7.5 medical services per year for the 641 subjects interviewed. Only 5% of the subjects could not be matched with benefits payments from either DVA or HIC. This is a plausible level of non-use of services in a four-year period, but also may partially be explained by failure of the matching algorithms to identify these subjects in the DVA or HIC indexes. In any case, such a small proportion of unmatched subjects is unlikely to materially affect the relationships examined by the regression analyses. Therefore, subjects for whom no payments were found were all classified as zero healthcare consumers for the purpose of the analyses.

2.6 REGRESSION MODELS

Table 2.1. For each healthcare consumption endpoint variables the following models were fitted

Model	Block 1 Age	Block 2 Physical Health	Block 3 Mental Health	Block 4 Predisposition	Block 5 Deployment	Block 6 Repatriation	Block 7 Exservice Involvement
1	–	–	–	–	–	–	–
2	✔	✔	–	–	–	–	–
3	✔	✔	✔	–	–	–	–
4	✔	✔	✔	✔	✔	✔	✔

A univariate linear regression approach was taken in examining the effects of 74 variables by calculating regression coefficients (betas) individually (Model 1). The relationship of each to medical care consumption was again examined after controlling for age and physical health (Model 2). For interest, although not critical for our examination of the relationship of PTSD with healthcare consumption, two further models were then fitted. Non-health variables were fitted individually after controlling for the mental health block (Model 3) and then the effect of each of the 37 variables chosen for the model was calculated with all blocks fitted (Model 4).

The seven blocks of factors were then examined in a linear regression model to assess the effect of each block of variables, as predictors of the subjects' medical care consumption. The R^2 statistic was calculated as an indicator of the contribution of each block of variables to the variance accounted for by the model. Each block was fitted to the model individually (Model 1). Each non-health factor block was then fitted with age, physical

health and mental health blocks together (Model 3), and then all blocks were fitted as in the complete model (Model 4). This analysis identified which groups of factors were most highly related to medical care consumption, and to what extent the predisposition, deployment, repatriation and exservice involvement blocks of factors were distinct from age, physical and mental health factors in their effects. It finally identified how each block contributed to the variance accounted for by the full model.

2.6.1 WHY LINEAR AND NOT POISSON REGRESSION?

Because of the probably skewed distribution of the errors in the healthcare consumption data, towards the low or non-user end, consideration was given to the use of Poisson regression models to examine the relationship between the predictor variables and healthcare consumption. However, when the data were fitted to the Poisson model, it was found to be no more likely to predict healthcare consumption levels of individual cases than the linear model. Some of the comparisons of analyses using the medical care consumption data between the two regression models are given in the seminar notes reproduced at Appendix 2.5.

As well as having similar relative precision in predicting the implications for healthcare consumption, the linear model was favoured because it allowed discussion of results in terms of healthcare consumption implications of each of the predictor variables. By interpreting the Betas from the linear regression models as dollar values of healthcare consumption associated with each unit of change in the predictor variables, it was simpler to illustrate the size of the relationship between healthcare consumption and the predictor variables.

It needs to be emphasised that while this decision is practical in this case, it would not necessarily be generally applicable. In some cases, for example where data are less variable, it is quite possible that a Poisson regression model would provide a more precise description of the relationship between the dependent and predictor variables and its use would be warranted (Gardner, Mulvey, & Shaw, 1995). For this reason, it would be a useful project to examine the relative ability of the regression models to predict individual case end point values using different data, particularly where R^2 values are higher. However, this would be outside the scope of this thesis research.

2.6.2 SO WHAT?

There were thus several reasons for using a regression approach to examine the main end point variables of self-reported healthcare consumption and medical care utilisation in their relationship with PTSD and other predictors. A primary reason for this choice was the ability to control for the effects of physical illness. As a preliminary step it was important to examine the general illness morbidity patterns of veterans in relation to men of the same age groups in the wider community. A logical and important question that is then raised by any finding of differential healthcare consumption in veterans is: "Are veterans sicker than their general community peers?" The basic comparative evidence bearing on this question is examined in the next chapter.

3 CHAPTER 3: SELF-REPORTED HEALTH STATUS OF VIETNAM VETERANS COMPARED WITH THE COMMUNITY

"Confirmation (of high veteran morbidity) would provide strong evidence that there are causal agents arising from military service and in particular Vietnam service that have had an adverse health effect in Vietnam veterans and their families".

(Commonwealth Department of Veterans Affairs, 1998) (p72).

3.1 CHAPTER 3 ABSTRACT

Self-reported physical health status of Australian Vietnam veterans was determined 20-25 years after the war and its relation to combat was investigated.

An epidemiological cohort study was conducted with a simple random sample of Army veterans posted to Vietnam between 1964 and 1972. Personal interview protocols used the Australian Bureau of Statistics Health Interview Survey to compare veterans with the Australian population and a 21-item combat exposure index was used to measure the relationship of combat to physical health.

Veterans self-reported greater health service usage and more recent health actions than population expectations. They also self-reported excess health problems in almost all categories of recent illness except endocrine conditions and cardiovascular conditions. Furthermore, only 6 of 37 chronic disease groups were not elevated compared to the community population. Adjustment for non-response changed estimates only slightly. Combat exposure was significantly related to reports of recent and chronic mental disorders, recent hernia and chronic ulcer, recent eczema and chronic rash, deafness, chronic infection and parasitic disease, chronic back disorders and symptoms, and ill-defined conditions. Similar studies have confirmed these findings.

Combat exposure may be associated with significantly increased reports of only some health problems. Because combat is unrelated to reports of most physical conditions, there does not seem to be a general disposition to complain as a result of health problems due to combat.

3.2 INTRODUCTION

Since the end of the Vietnam War, the health status of Vietnam veterans compared with the general community has attracted growing speculation and research effort by governments and independent researchers (O'Toole et al., 1996b). Figure 3.1 shows the number of health research papers published over the past twenty-five years. Much of this has related to research carried out with American veterans.

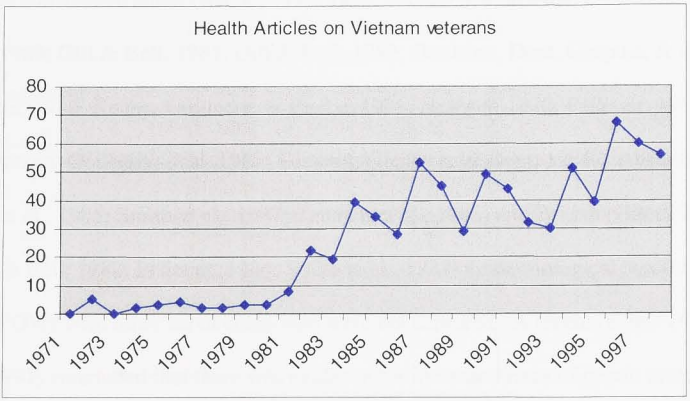

Figure 3.1. Research papers published annually on Vietnam Veterans health

The most recent efforts to measure Australian Vietnam veterans' relative health status was in the Department of Veterans' Affairs Vietnam Veterans Health Study conducted from 1996 to 1998 and a subsequent validating study being conducted by the Australian Institute of Health and Welfare (AIHW) (Commonwealth Department of Veterans Affairs, 1998; Minister for Veterans' Affairs, 1999). These studies could themselves be seen as replicating the results of the Australian Vietnam Veterans Health Study (AVVHS). This chapter reports and comments on the findings of the comparison of the health of Vietnam veterans with community peers. A copy of the AVVHS published paper is provided at Appendix 3.1.

Participants in war may experience certain short-term somatic effects soon afterwards (Solomon & Mikulincer, 1987). However, the question of the fact and extent of long-term physical health effects has received little scientific attention (Venn & Guest, 1991).

Studies have been reported of prisoners of war (POWs), who have arguably undergone more severe war-related stress (Beebe, 1995; Dent, Richardson, Wilson, Goulston, & Murdoch, 1989; Gill & Bell, 1981; Gill & Bell, 1982; Goulston, Dent, Chapuis, & al, 1985; Keehn, 1980; Keehn, Goldberg, & Beebe, 1974; Nefzger, 1970; Pelletier, 1984; Smith, Patterson, Goulston, & al, 1987; Tennant, Goulston, & Dent, 1986). Australian (Goulston et al., 1985; Smith et al., 1987; Tennant et al., 1986) and British (Gill & Bell, 1981; Gill & Bell, 1982; Pelletier, 1984; Smith et al., 1987) epidemiological studies have compared POWs with other servicemen who were not captured. A recent review (Venn & Guest, 1991) concluded that there was evidence for increased rates of peptic ulcer, strongyloidiasis, neurologic conditions (principally hearing loss), and anxiety and depression among former POWs held in Asia compared with military peers (Gill & Bell, 1981; Gill & Bell, 1982; Goulston et al., 1985; Pelletier, 1984; Smith et al., 1987; Tennant et al., 1986). Past and present hepatitis infections (A, B) were more prevalent in POWs than non-POWs. However, the levels were quite high among non-POWs compared with community expectations, possibly arising from the comparison group also having served in South East Asia during World War II. While these types of studies focus on the direct effects of being a POW, they do not inform about the health effects of participation in war per se. Moreover, there have been few large cohort studies performed, although several smaller studies have examined the effects of service in particular locations or under particular conditions (Venn & Guest, 1991).

To determine these effects requires a design extending beyond special groups such as POWs and ideally incorporating a comparison group who did not go to war. These requirements were met by a large-scale epidemiological study that was conducted by the

American Centers for Disease Control (CDC). This study examined physical and mental health of Vietnam veterans and a comparison group of military personnel who served at the same time but elsewhere (Centers for Disease Control, 1988c; Centers for Disease Control, 1988d). The CDC study found that, compared with men serving elsewhere, Vietnam veterans self-reported more current and past health problems; limitations to activities, prescribed medication use, somatic symptoms, deafness, hypertension, chloracne and other skin conditions, ulcers, hepatitis, liver conditions, urinary tract problems, and benign growths, although there was no excess cancer. Little of the self-reported excess was substantiated on medical examination of a sub-sample, although Vietnam veterans had more signs of deafness, a 4% higher mean serum level of thyroid-stimulating hormone and higher prevalence of hepatitis B antibodies. This last finding is consistent with the results from the Australian POWs and non-POWs of WWII who also served in South East Asia (Goulston et al., 1985; Smith et al., 1987; Tennant et al., 1986).

Another recent large-scale epidemiological study of American Vietnam veterans, the National Vietnam Veterans Readjustment Study (NVVRS) (Kulka et al., 1990a; Kulka et al., 1990b), was directed to psychiatric conditions, particularly post-traumatic stress disorder (PTSD). It reported only a health index based on the self-reported number of recent and chronic conditions and a limited number of health actions taken in relation to physical and mental health. There was no ascertainment of self-reported prevalence of illness in specific disease categories.

These studies of the role of combat and other stress exposure on physical illness are inconsistent. The CDC study (Decoufle et al., 1992) found that all 21 of the physical health outcomes were related to Vietnam service, although after adjustment for perceived

'agent orange' exposure the effects became non-significant. By contrast, the NVVRS (Kulka et al., 1990a; Kulka et al., 1990b) reported significantly more chronic health problems among a subgroup of men exposed to high war zone stress. Consistent with this finding, a report from the Israeli Army (Solomon & Mikulincer, 1987) suggests that the lingering effects of traumatic exposure, such as PTSD, are more important to self-reported somatic complaints than combat exposure.

The overall aim of the AVVHS was to determine, by personal interview, the prevalence of self-reported physical and mental illness in a random sample of Australian Vietnam veterans and to examine the relative contributions of pre-enlistment characteristics, war experiences and post-war experiences to that illness. This chapter reports results from the AVVHS on the raw and adjusted prevalences of health conditions and compares these with Australian population estimates using the Australian Bureau of Statistics Health Interview (Australian Bureau of Statistics, 1991b). Response bias was corrected through a regression-based adjustment of the reported prevalences and the association of morbidity with combat exposure was explored.

3.3 METHOD

The design of the AVVHS epidemiological study is described in Chapter 2 and published papers (O'Toole et al., 1996a). Briefly, self-reported health of 641 Australian Vietnam veterans was ascertained using the questionnaire designed for the Australian Bureau of Statistics (ABS) Health Interview Survey 1989-1990 (Australian Bureau of Statistics, 1991b). The ABS survey selected an area probability sample of 30,000 households and used trained ABS interviewers and standardised survey procedures to derive national population estimates of morbidity. Using closely similar survey methods (except

sampling) gave the advantage of comparison with the morbidity estimates for the Australian population and enabled calculation of relative risks for illness categories. Two slight modifications to the questionnaire were undertaken: the demographic section was relocated to the end of the questionnaire instead of at the beginning (as administered by ABS), and the diet and the women's health sections were omitted. The fieldwork, interviewer and office manuals used by ABS were made available to the study and were modified accordingly. The chief investigators undertook interviewer training.

The ABS interview began with 4-point Likert items on self-reported health state and self-reported happiness, proceeded to recent health actions and the acute illness that had prompted them, then to chronic illness, then to the major health risk factors (tobacco, alcohol, exercise), and finally demographic items were asked. Acute illnesses were asked about in the context of a 'gate' or sequence question on whether the respondent had taken each specific recent health action. The health actions were: hospitalisation in the past year, casualty/outpatients attendance in past two weeks, doctor consultation in past two weeks, visits to specified non-medical health practitioners, current medications by category, days off work, days in bed, or days of reduced activity in the past two weeks. The 'gate' questions were followed with questions of frequency of the action and of the medical conditions (up to three) that caused the action. Chronic conditions were identified using a series of 'open' questions. They asked about long-term conditions. These included conditions that had lasted or were likely to last 6 months or more, or that recurred from time to time such as asthma or hay fever. They also included those that had been experienced for a long time and been adjusted to, such as arthritis or a bad back, as well as those that were under control because of long-term treatment, such as impaired

vision or high blood pressure. Then a checklist of 53 different types of conditions was shown. Interviewers were required to record illness conditions, rather than symptoms, as reasons for health actions. Medical conditions were coded into ICD-9 groupings according to the ABS conditions coding manual. Two coders coded all medical conditions independently, and the results were compared, with discrepancies resolved by a chief investigator. The questionnaire is included as Appendix 2.3.

For comparison with the Australian population, results were age-standardised to the veteran sample. The number of cases among the interviewed veterans and thus the prevalence was computed. The expected number of cases and the prevalence in each category was calculated by standardising the male Australian population to the age distribution of the veterans; the ratios of the prevalences and their confidence intervals were then computed. Because there were many variables being evaluated, and some of these could be statistically significant by chance, the 99% confidence intervals for the relative prevalences were computed to permit a more stringent criterion for statistical significance of individual estimates. Two estimates from the veteran sample were computed. Firstly an observed or 'raw' prevalence ratio was calculated, based on the 641 subjects interviewed and the expected prevalence in the corresponding age-standardised Australian population. The second estimate was applied to the morbidity endpoints prevalence measures. They were adjusted for the effects of non-response as described in the appendix to the methodology paper attached as Appendix 2.2. Briefly this adjustment involved calculating the predicted response values over all 950 subjects. The calculation used a logistic regression based on the demographic and army service characteristics of the 950 subjects who were eligible for interview (i.e. 50 known deceased excluded), and

the average observed value among those on whom the model was fitted (the 641 interviewed subjects).

A model was fit to the illness prevalence using army data that we were able to obtain on the 641 interviewed subjects. This model was then used with army data on the missing subjects to predict the illness levels in the missing subjects if they followed the same model as those interviewed. Generally the missing subjects were slightly higher on risk factors and therefore estimated as slightly higher on most but not all of the morbidity estimates than those interviewed.

To examine the relationship between **combat exposure and morbidity**, a number of combat exposure indicators were examined, including assignment to a combat unit and two self-report scales of combat exposure. The main combat exposure indicator used was the 21 item questionnaire developed by Wilson and Krauss (1985). The mean combat exposure from this measure was compared between the groups of subjects who reported and those who did not report each of the 37 disease categories. Combat exposure was also ranked in quartiles and the odds ratio for reporting each disease category was calculated for each quartile in relation to the quartile of subjects with the lowest measured combat exposure.

3.4 RESULTS

Table 3.1 shows the self-reported states of health and happiness compared with the age-sex adjusted general population. Veterans, overall, perceived their health state as poorer and themselves as less happy than the Australian population. Interestingly, although the CDC study (Centers for Disease Control, 1988a) did not include the question on happiness, they included the same health state question, to which 27.2% responded

'excellent', 56.5% responded 'good', 14.8% responded 'fair' and only 1.5% responded 'poor'. Thus more Australian veterans tended to see their health as poor than the generally younger veterans studied by CDC.

Table 3.1 Distribution of self-reported states of health and happiness of veterans compared with the age-sex matched Australian population. The ratio of proportions is shown 'raw' (non-response adjustment was applied only to morbidity endpoints)

	Vietnam veterans (n=641) (%)	Australian population expected (%)	Raw RR	99% CI
Perceived health state :				
Excellent	17.1	29.3	0.58	(0.45, 0.71)
Good	50.4	52.5	0.96	(0.86, 1.06)
Fair	24.3	14.3	1.70	(1.39, 2.00)
Poor	8.3	3.8	2.18	(1.45. 2.92)
Perceived happiness :				
Very happy	18.7	24.1	0.78	(0.61, 0.94)
Happy	69.0	70.9	0.97	(0.91, 1.04)
Unhappy	10.3	4.2	2.45	(1.72, 3.19)
Very unhappy	1.7	0.8	2.12	(0.48, 3.77)

Australian veterans self-reported an average of 2.39 recent conditions (range 0-11, SD = 1.55) and 3.80 chronic conditions (range 0-8, SD - 2.23), whereas the corresponding means for the Australian population were 1.69 and 2.08 respectively. This indicates that veterans reported significantly more diagnoses than the same age/sex groups in the general population for both recent ($t=11.003$, $df=12107$, $p<0.001$) and chronic conditions ($t=24.588$, $df=12107$, $p<0.001$).

Table 3.2 Number of recent health actions taken by veterans and alcohol and smoking status compared to the age-sex standardised Australian population; relative prevalences are shown both adjusted and unadjusted for non-response. (RRs are AVVHS/ABS: i.e. if >1 veterans' morbidity higher.)

	Raw prevalence Vietnam veterans (n=641)	Australian population raw RR	Response adjusted prevalence	Response adjusted RR
	(%)	(99% CI)	(%)	(99% CI)
Hospital inpatient	1.4	1.35 (1.01, 1.68)*	1.4	1.34 (1.00, 1.67)
Visit casualty/outpatients	4.8	2.36 (1.30, 3.43)*	5.6	2.77 (1.61, 3.92)
Doctor consultation	23.3	1.45 (1.18, 1.72)*	23.7	1.49 (1.22, 1.77)
Dental consultation	5.8	1.22 (0.72, 1.73)	6.1	1.29 (0.78, 1.81)
Other health professional	15.7	2.04 (1.56, 2.53)*	15.9	2.08 (1.60, 2.57)
Days off work	11.3	1.92 (1.37, 2.47)*	11.0	1.88 (1.34, 2.42)
Days in bed	6.0	1.16 (0.62, 1.70)	6.5	1.67 (1.03, 2.31)
Days of reduced activity	23.3	3.09 (2.52, 3.66)*	23.0	3.08 (2.51, 3.66)
Medications :				
Vitamins, minerals	26.2	1.37 (1.14, 1.61)*	24.9	1.31 (1.08, 1.54)
Coughs, colds	14.6	1.66 (1.25, 2.07)*	15.8	1.81 (1.39, 2.24)
Skin creams	39.5	2.37 (2.07, 2.67)*	38.4	2.31 (2.01, 2.60)
Allergy	7.8	1.46 (0.95, 1.97)	7.9	1.46 (0.95, 1.97)
Stomach, laxatives	15.4	1.99 (1.51, 2.46)*	15.4[a]	2.01 (1.53, 2.49)
Cardiovascular	12.6	1.17 (0.86, 1.49)	13.3	1.26 (0.93, 1.59)
Sleeping	9.4	2.44 (1.67, 3.21)*	11.0	2.91 (2.07, 3.75)
Pain	50.2	1.56 (1.40, 1.71)*	51.3	1.60 (1.44, 1.76)
Tranquillisers	8.7	3.43 (2.30, 4.55)*	8.9	3.51 (2.37, 4.66)
Other	19.0	1.24 (0.98, 1.50)	19.0	1.26 (1.00. 1.52)
Smoking :				
Current smoker	26.5	0.86 (0.74, 0.97)*	34.8	1.12 (0.97, 1.28)
Former smoker	54.5	1.69 (1.56, 1.82)*	40.7	1.26 (1.10, 1.41)
Never smoked	18.1	0.49 (0.40, 0.58)*	24.0	0.66 (0.54, 0.77)
Alcohol risk : [b]				
Low	76.5	0.89 (0.85, 0.93)*	77.4	0.90 (0.85, 0.95)
Medium	13.2	1.32 (1.04, 1.50)*	8.9	1.24 (0.84, 1.65)
High	9.9	1.45 (1.08, 1.81)*	13.6	1.99 (1.48, 2.51)

[a] Not adjusted for non-response as the logistic model contained no cases with attributes of non-responders (ie no independent variables)
[b] Risk groups of Australian Bureau of Statistics
* Significant RR (99% CI)

Table 3.2 shows the frequency of each health action taken in the two weeks prior to interview (except hospitalisation, which was past year), medications taken in the prior two weeks and smoking and alcohol status. Fewer veterans than the population reported no recent or chronic illness. More veterans than the population reported visiting a hospital casualty or outpatients department, a doctor and other health professionals. More veterans had days off work or days of reduced activity than expected from population estimates. Veterans also consumed most medications (except cardiovascular, allergy and 'other') at significantly higher rates than the Australian population (99% CI). Veterans had a higher number of doctor visits and those not visiting the doctor in the prior two weeks had a more recent history of consultation than the population. Similar proportions of veterans were current smokers, but more were former smokers and thus fewer had never smoked. Fewer veterans were in low-risk average alcohol intake groups (<50 g of alcohol per day) and more were in moderate and high-risk groups (>75 g of alcohol per day). These results were obtained whether raw or response-adjusted comparisons were made; adjustment for non-response changed the prevalences and relative prevalences only slightly, except for smoking and alcohol. In addition, for three conditions, the logistic model contained no cases in the 641 interviewed subjects to provide values for independent variables to apply in the logistic regression model to predict the prevalence in the sample of all 950 subjects.

Table 3.3 Prevalence of medical conditions for which recent health actions were taken by Australian Vietnam veterans and their relative prevalences compared with the age-sex standardised Australian population, both unadjusted ('raw') and adjusted for response bias. (RRs Veterans/Community)

	Raw prevalence Vietnam veterans (n = 641) (%)	Australian Population Raw RR (99% CI)	Response adjusted prevalence (%)	Response adjusted RR (99% CI)
Infective & parasitic disease	6.4	2.44 (1.49, 3.40)*	6.5	2.46 (1.51, 3.42)
Neoplasms	4.7	4.48 (2.42, 6.53)*	5.0	4.91 (2.74, 7.09)
Endocrine system :				
Cholesterol	3.1	2.95 (1.28, 4.63)*	3.1[a]	3.00 (1.30, 4.70)
Diabetes	1.9	1.53 (0.40, 2.66)	1.9[a]	1.57 (0.41, 2.73)
Gout	4.1	1.77 (0.90, 2.65)	3.7	1.65 (0.80, 2.51)
Other endocrine	2.3	1.97 (0.67, 3.26)	2.3[a]	1.98 (0.68, 3.28)
Diseases of blood-forming organs	0.0		0.0[a]	
Mental disorders :				
Nerves, nervousness	7.3	2.78 (1.77, 3.78)*	7.3[b]	2.80 (1.79, 3.81)
Depression	3.3	3.57 (1.60, 5.54)*	3.3[b]	3.57 (1.60, 5.54)
Other mental illness	3.0	4.92 (2.06, 7.79)*	3.0[a]	4.92 (2.06, 7.79)
Sensory/nervous system disorders :				
Disorders of refraction	2.7	2.53 (0.97, 4.09)	2.7[a]	2.54 (0.97, 4.10)
Deafness	0.8	10.00(0.0, 21.47)	0.8[a]	10.15(0.0,21.79)
Migraine	6.9	5.11 (3.20, 7.02)*	6.9	5.13 (3.21, 7.04)
Other sensory/nervous	3.6	1.25 (0.59, 1.90)	3.5	1.21 (0.56, 1.85)
Circulation system :				
Hypertension	8.1	0.93 (0.61, 1.24)	9.4	1.09 (0.75, 1.44)
Heart disease	2.5	1.37 (0.50, 2.24)	2.5[a]	1.42 (0.52, 2.33)
Hemorrhoids	1.4	4.66 (0.69, 8.64)	1.4[a]	4.65 (0.69, 8.61)
Other circulatory system	3.9	1.40 (0.70, 2.11)	3.7	1.35 (0.65, 2.06)
Respiratory system :				
Colds	7.6	1.10 (0.71, 1.49)	7.7	1.11 (0.72, 1.50)
Hay fever	7.3	1.81 (1.16, 2.46)*	7.3[a]	1.81 (1.15, 2.46)

Asthma	3.4	1.35 (0.62, 2.08)	3.4	1.36 (0.62, 2.09)
Bronchitis, emphysema	1.2	2.01 (0.19, 3.83)	1.2[a]	2.10 (0.20, 4.00)
Other respiratory	11.2	1.96 (1.40, 2.25)*	12.4	2.16 (1.58, 2.75)
Digestive system :				
Ulcer	3.9	2.03 (1.01, 3.06)*	3.8	2.02 (0.99, 3.05)
Hernia	1.4	1.68 (0.25, 3.10)	1.4[a]	1.69 (0.25, 3.14)
Other digestive	12.9	1.34 (0.99, 1.69)	12.3	1.28 (0.93, 1.62)
Genito-urinary system	1.2	1.51 (0.14, 2.87)	1.2[a]	1.53 (0.15, 2.91)
Skin :				
Rash	10.3	4.47 (3.13, 5.81)*	9.9	4.31 (2.99, 5.62)
Eczema	7.8	1.87 (1.22, 2.53)*	8.1	1.96 (1.29, 2.63)
Other skin	9.7	1.82 (1.26, 2.39)*	8.9	1.68 (1.14, 2.23)
Musculoskeletal disorders :				
Arthritis	7.3	2.24 (1.43, 3.04)*	7.9	2.47 (1.61, 3.33)
Rheumatism	0.2	0.59 (0.0, 2.11)	0.2[a]	0.60 (0.0, 2.14)
Back disorders	11.5	2.07 (1.49, 2.66)*	12.0	2.16 (1.56, 2.75)
Other musculoskeletal	10.9	1.69 (1.20, 2.18)*	10.9	1.69 (1.20, 2.18)
Disability	0.2	1.79 (0.0, 6.38)	0.2[a]	1.81 (0.0, 6.46)
Injury	8.9	1.49 (1.00, 1.97)*	9.1	1.52 (1.03, 2.01)
Symptoms, signs and ill-defined conditions	36.0	1.66 (1.43, 1.88)*	36.5	1.67 (1.45, 1.90)

[a] Fewer than 21 cases: adjustment for eligible population age distribution only.
[b] Logistic model contained no independent variables.
* Significant RR (99% CI)

Table 3.3 shows the prevalence of recent illness for which a health action was taken and the relative age-adjusted prevalence compared to the Australian population, both unadjusted and adjusted for non-response. Adjustment was only partially successful, as it was not feasible to obtain adjusted estimates for 14 conditions which occurred in 20 or fewer veterans (i.e. prevalence less than 3.1%). Thus, rarer conditions remain unadjusted for non-response. Adjustment had little effect on prevalence and relative prevalence estimates. Of 36 groups of conditions (there were no blood disorders), 18 had relative prevalences significantly greater than 1.00 and 18 had prevalences with 99%

confidence intervals that included 1.00. Veterans' self-reported prevalence was no higher than controls for endocrine conditions, except high cholesterol, and there were no excess cardiovascular conditions or gastrointestinal conditions. There were higher reports of infective and parasitic disease, neoplasms, all of the mental disorders, migraine and deafness (but not disorders of refraction or other nervous system disease), all skin conditions, musculoskeletal disorders and isolated symptoms and signs. Adjustment again did not greatly affect the prevalences or relative prevalences for any disease group.

Table 3.4 Prevalence of chronic medical conditions self-reported by Australian Vietnam veterans and their relative prevalences compared with the age-sex standardised Australian population, both unadjusted ('raw') and adjusted for response bias.

	Raw prevalence Vietnam veterans (n = 641) (%)	Australian Population Raw RR (99% CI)	Response adjusted prevalence (%)	Response adjusted RR (99% CI)
Infective & parasitic disease	4.2	4.79 (2.47, 10.77)*	4.6	5.20 (2.79, 7.62)
Neoplasms	7.8	4.51 (2.93, 8.65)*	8.2	4.82 (3.18, 6.46)
Endocrine system :				
Cholesterol	11.1	2.75 (1.96, 4.85)*	11.0	2.73 (1.94, 3.52)
Diabetes	3.9	2.72 (1.35, 6.26)*	3.8	2.71 (1.32, 4.09)
Gout	9.4	3.11 (2.12, 5.70)*	9.6	3.21 (2.21, 4.22)
Other endocrine	6.1	3.13 (1.88, 6.37)*	9.6	4.96 (3.42, 6.51)
Diseases of blood-forming organs	0.8	3.23 (0.0, 12.62)	0.8[a]	3.29 (0.0, 7.07)
Mental disorders :				
Nerves, nervousness	10.9	8.87 (6.30, 15.73)*	12.2[b]	9.95 (7.23, 12.67)
Depression	2.2	3.49 (1.12, 9.56)*	2.2[a]	3.47 (1.11, 5.83)
Other mental illness	5.3	4.15 (2.37, 8.77)*	6.0	4.69 (8.80, 6.58)
Sensory/nervous system disorders :				
Disorders of refraction	48.8	1.09 (0.98, 1.48)	47.7	1.08 (0.96, 1.19)
Deafness	30.3	4.90 (4.14, 7.14)*	30.0	4.91 (4.15, 5.68)

Migraine	6.9	2.30 (1.44, 4.45)*	7.5	2.50 (1.61, 3.39)
Other sensory/nervous	12.6	2.26 (1.66, 3.88)*	12.2	2.19 (1.59, 2.79)
Circulation system :				
Hypertension	18.4	2.08 (1.63, 3.31)*	19.0	2.17 (1.71, 2.62)
Heart disease	3.6	2.02 (0.96, 4.77)	3.4	1.98 (0.91, 3.05)
Haemorrhoids	12.5	6.90 (5.04, 11.88)*	13.5	7.43 (5.51, 9.34)
Other circulatory system	7.8	2.07 (1.35, 3.97)*	8.9	2.39 (1.61, 3.17)
Respiratory system :				
Colds	0.2	1.96 (0.0, 14.74)	0.2[a]	1.98 (0.0, 7.06)
Hay fever	19.0	1.54 (1.21, 2.43)*	19.7	1.59 (12.7, 1.92)
Asthma	3.9	0.87 (0.43, 2.00)	4.1	0.91(0.46, 1.36)
Bronchitis, emphysema	8.6	3.91 (2.62, 7.33)*	8.8	4.13 (2.78, 5.47)
Other respiratory	4.5	3.88 (2.07, 8.57)*	4.6	4.00 (2.15, 5.85)
Digestive system :				
Ulcer	6.9	2.83 (1.77, 5.60)*	6.5	2.72 (1.67, 3.76)
Hernia	8.3	3.28 (2.17, 6.21)*	7.9	3.18 (2.08, 4.28)
Other digestive	9.0	3.23 (2.19, 5.98)*	8.3	2.98 (1.97, 3.99)
Genito-urinary system	3.6	2.31 (1.09, 5.43)*	3.6[b]	2.34 (1.10, 3.57)
Skin :				
Rash	6.9	21.26 (13.29, 42.03*)	8.6	26.61 (17.77, 35.45)
Eczema	15.4	6.29 (4.79, 10.35)*	15.8	6.42 (4.91, 7.92)
Other skin	7.0	3.04 (1.91, 5.97)*	7.5	3.25 (2.09, 4.41)
Musculoskeletal disorders :				
Arthritis	15.1	1.46 (1.11, 2.42)*	15.1	1.48 (1.12, 1.84)
Rheumatism	2.5	2.81 (1.02, 7.39)*	2.5[a]	2.85 (1.04, 4.66)
Back disorders	36.3	1.77 (1.53, 2.51)*	37.1	1.81 (1.57, 2.05)
Other musculoskeletal	12.2	1.20 (0.87, 2.07)	12.6	1.23 (0.90, 1.56)
Disability	0.9	1.14 (0.0, 4.17)	0.9[a]	1.14 (0.0, 2.34)
Injury	7.0	4.72 (2.97, 9.29)*	7.2	4.86 (3.09, 6.63)
Symptoms, signs and ill-defined conditions	9.0	2.75 (1.86, 5.09)*	9.1	2.77 (1.88, 3.66)

[a] Fewer than 21 cases: adjustment for eligible population age distribution only.
[b] Logistic model contained no independent variables.
* Significant RR (99% CI)

Table 3.4 shows the prevalence of reports of chronic conditions and the relative prevalence compared to population expectations, both unadjusted and adjusted for non-

response. Adjustment for chronic conditions was more successful than for recent conditions. Only five were too infrequent to model, only one model contained no independent variables, while the remaining 31 were adjustable. The most prevalent conditions were disorders of refraction, back disorders, deafness, hay fever, hypertension and eczema. There were more reports than expected of rashes, nerves, haemorrhoids, eczema, infective and parasitic disease, injuries, neoplasms and other mental disorders (under which PTSD is coded). Again, only small changes occurred to the prevalence or relative prevalence estimated after adjustment for non-response; 9 were slightly lower, 21 were slightly higher, and one was the same. The 99% confidence interval for the relative prevalences included 1.00 for only 6 of the 37 disease groups; disorders of refraction, heart disease, colds and asthma, other musculoskeletal disorder and disabilities; in all of the remaining disease groups, veterans self-reported significantly more morbidity than population expectations.

3.4.1 THE RELATION OF ILLNESS TO COMBAT

Two measures of combat exposure were available (O'Toole et al., 1996a). One was derived from information from Army records and was based on being posted to units with increasing combat exposure, weighted by the length of posting. The other was a 21 - item self-report inventory comprising questions on different aspects of war stress exposure. The two different measures gave quite different results, despite being moderately correlated ($r = 0.44$). Those subjects who were posted to a combat unit were more likely to report more recent treatment for depression ($P = 0.010$) and deafness ($P = 0.049$), and more chronic deafness ($P = 0.049$) and other skin conditions ($P = 0.029$). None of the remaining conditions was statistically significant in their association with the

combat unit to which the veteran was posted. Self-reported combat exposure is used in the following tables because it is considered to be a more valid indicator of actual combat exposure than the unit to which veterans were posted. On one hand, veterans posted to non-combat units were often exposed to enemy action during periods of peak hostilities and on the other veterans could be posted to combat units in support roles such as medical, stores and catering and see little combat exposure. Also, during certain periods, it was not unusual for even combat troops to complete a tour of duty with little or no combat exposure.

In contrast to the small number of conditions mentioned above that showed a significant statistical relationship with posting to a combat unit, Tables 3.5 and 3.6 show several current and chronic health problems as significantly associated with self-reported levels of combat exposure. Higher combat exposures were self-reported by men who had recent treatment for nerves, depression, other mental disorders, hernia, eczema, back disorders, and for ill-defined symptoms and signs. Higher self-reported combat was also significantly related to reports of chronic infective and parasitic disease, nerves, other mental conditions (which includes PTSD), deafness, ulcer, rash, rheumatism, and back disorders.

Table 3.5 Odds ratios for risk of recent illness conditions associated with each quartile of the self-reported combat index compared with the first (lowest) quartile, and the P -value of the t-test of association with the (continuous) combat score.

	1st quartile	2nd quartile	3rd quartile	4th quartile	P
Infective & parasitic disease	1.00	2.04	1.93	1.89	0.195
Neoplasms	1.00	0.34	1.03	1.35	0.150
Endocrine system :					
Cholesterol	1.00	0.98	1.21	1.08	0.801
Diabetes	1.00	2.36	3.22	3.44	0.538
Gout	1.00	0.92	0.67	1.15	0.712
Other endocrine	1.00	0.79	1.34	1.15	0.802
Mental disorders :					
Nerves, nervousness	1.00	4.32	6.84	7.32	0.003*
Depression	1.00	1.05	1.34	2.58	0.025*
Other mental illness	1.00	1.57	4.83	7.75	0.008*
Sensory/nervous system disorders :					
Disorders of refraction	1.00	2.75	2.01	1.29	0.879
Deafness	1.00	0.79	0.80	1.72	0.993
Migraine	1.00	0.42	0.70	0.46	0.068
Other sensory/nervous	1.00	0.67	0.46	0.74	0.648
Circulation system :					
Hypertension	1.00	1.14	1.02	0.86	0.338
Heart disease	1.00	1.31	0.54	1.72	0.527
Haemorrhoids	1.00	1.18	1.21	0.43	0.629
Other circulatory system	1.00	1.57	1.61	2.87	0.873
Respiratory system :					
Colds	1.00	1.35	2.18	1.35	0.651
Hay fever	1.00	0.56	0.63	0.68	0.676
Asthma	1.00	1.97	2.41	3.44	0.063
Bronchitis, emphysema	1.00	1.57	1.61	2.58	0.351
Other respiratory	1.00	0.51	0.59	0.64	0.156
Digestive system :					
Ulcer	1.00	0.39	0.94	1.15	0.284
Hernia	[a]	1.00	6.84	[a]	0.011*
Other digestive	1.00	2.27	2.24	2.20	0.100
Genito-urinary system	1.00	2.36	1.61	1.72	0.667
Skin :					
Rash	1.00	3.30	3.54	3.10	0.069
Eczema	1.00	3.14	2.01	4.30	0.007*
Other skin	1.00	0.69	0.75	0.91	0.809
Musculoskeletal disorders :					
Arthritis	1.00	1.18	1.41	1.40	0.216
Rheumatism	[a]	[a]	1.00	[a]	0.862
Back disorders	1.00	2.16	2.21	2.37	0.047*
Other musculoskeletal	1.00	1.97	2.11	2.26	0.066
Disability	[a]	[a]	1.00	[a]	0.727
Injury	1.00	1.22	1.34	1.72	0.466
Symptoms, signs and ill-defined conditions	1.00	1.08	1.22	1.28	0.029*

[a] No cases in quartile.

* p<0.05

Table 3.6 Odds ratios for risk of chronic conditions associated with each quartile of the self-reported combat index compared with the first (lowest) quartile, and the P -value of the t-test of association with the (continuous) combat score

	1st quartile	2nd quartile	3rd quartile	4th quartile	P
Infective & parasitic disease	1.00	0.26	0.94	1.72	0.024*
Neoplasms	1.00	1.38	1.31	1.51	0.150
Endocrine system :					
Cholesterol	1.00	1.81	1.45	1.64	0.419
Diabetes	1.00	0.56	0.92	0.61	0.557
Gout	1.00	1.48	1.79	1.34	0.642
Other endocrine	1.00	1.18	1.34	2.01	0.084
Disease of blood-forming organs	1.00	1.57	0.80	0.86	0.746
Mental disorders :					
Nerves, nervousness	1.00	2.36	3.08	3.16	0.005*
Depression	1.00	3.14	3.22	4.30	0.096
Other mental illness	1.00	1.57	2.68	4.30	0.002*
Sensory/nervous system disorders :					
Disorders of refraction	1.00	1.07	1.14	1.07	0.664
Deafness	1.00	1.49	1.29	1.69	0.041*
Migraine	1.00	0.66	0.67	0.86	0.965
Other sensory/nervous	1.00	0.83	1.02	0.82	0.559
Circulation system :					
Hypertension	1.00	1.30	1.25	1.42	0.298
Heart disease	1.00	1.10	0.64	1.03	0.740
Haemorrhoids	1.00	0.55	0.80	1.08	0.392
Other circulatory system	1.00	0.63	1.37	1.29	0.470
Respiratory system :					
Colds	[a]	[a]	1.00	[a]	0.559
Hay fever	1.00	0.68	0.97	0.86	0.948
Asthma	1.00	0.79	0.69	0.49	0.272
Bronchitis, emphysema	1.00	1.57	1.52	0.96	0.816
Other respiratory	1.00	0.79	1.74	0.57	0.546
Digestive system :					
Ulcer	1.00	0.69	1.21	1.72	0.042*
Hernia	1.00	1.24	0.67	0.79	0.375
Other digestive	1.00	0.97	0.87	0.99	0.611
Genito-urinary system	1.00	0.66	1.07	0.57	0.697
Skin :					
Rash	1.00	3.93	2.68	4.59	0.041*
Eczema	1.00	1.20	1.04	1.72	0.062
Other skin	1.00	1.18	1.11	1.51	0.428
Musculoskeletal disorders :					
Arthritis	1.00	1.31	1.56	1.61	0.057*
Rheumatism	[a]	1.00	11.26	4.38	0.006*
Back disorders	1.00	1.35	1.24	1.48	0.044*
Other musculoskeletal	1.00	0.69	1.33	0.91	0.988
Disability	1.00	0.39	0.40	0.86	**0.723**
Injury	1.00	1.01	1.84	1.48	0.736
Symptoms, signs and ill-defined conditions	1.00	0.79	1.54	1.17	0.290

[a] No cases in quartile.
* p<0.05

Tables 3.5 and 3.6 show the odds-ratios for increases in prevalence of each condition with increases in combat scale score (each successive quartile compared with the lowest). The tables also show the P values resulting from a t for equality of mean combat exposure scores (as measured by the 21 item continuous scale (Wilson & Krauss, 1985)) of subjects reporting each of the 37 disease categories and those who did not.

Clear 'dose-response' relationships are apparent for recent mental disorders. The relationship for hernia is less obvious, with no cases occurring in the lowest and highest combat-quartiles. While there was a statistically significant linear association of eczema with combat there was evidence also of a cubic trend, which makes interpretation more problematic. The linear trends evident in recent asthma, rash, and other musculoskeletal disorders failed to reach statistical significance. For chronic conditions, again the mental disorders show increasing linear relationships with combat, except for depression, which failed to reach significance. Deafness also increased with combat exposure, as did ulcer.

3.5 DISCUSSION

Whether before or after adjustment for potential response bias, veterans self-reported significantly more recent infective and parasitic disease, neoplasms, high cholesterol and other endocrine disease, more mental disorders, migraine, hay fever and other respiratory conditions, ulcers, skin conditions, musculoskeletal disorders except rheumatism, injuries and symptoms, signs and ill-defined conditions. They did not report more recent diabetes or gout, sensory or nervous system disorders (except migraine), digestive disorders (except ulcer), and disabilities. They self-reported all chronic conditions significantly more often except heart disease, asthma, disabilities and other musculoskeletal disorders, and the relatively rare blood disease.

It might be expected that socioeconomic status differences are associated with reported illness, however compared to the Australian population, veterans had similar employment and schooling status, but had higher educational achievement and higher incomes. However, past employment remains a possible cause of higher reports. For example, in addition to the excess reports of skin conditions there were 50 conditions coded as neoplasms, which included 39 skin cancers. Of these, 20 veterans volunteered that they were due to sun exposure while working outdoors. The 50 cancers self-reported were described in various ways. There were four reports of 'melanoma', one 'hairy-cell leukaemia', one 'bladder cancer', one 'mouth cancer' (initially discovered by a dentist), one 'brain tumour', one 'benign growth on larynx', one 'bowel cancer', 37 skin cancers and three ill-defined cancers (variously described by veterans as 'cancerous lumps on stomach', 'benign cancer lumps', and 'various tumours and lumps'). There were three described as 'benign'. Survey evidence for the presence of illness is notoriously uncertain. In the case of neoplasms, the appropriate diagnostic procedures were not available to produce definitive prevalence estimates (Kricker et al., 1990). It could be assumed that the more specific descriptions of cancer were more likely to have arisen where a diagnosis was received and actual treatment given. If so, then there would remain eight non-skin cancers; if the skin cancers which were self-reported were also accompanied by reports of surgery then this adds another six cases for a total of 14, where 11.1 would be expected from ABS population prevalence estimates. However, these estimates also include benign neoplasms in the category 'neoplasms'- tumour, cyst or growth. The veterans attributed twelve of the cancers to exposures to sun or chemicals

while in Vietnam. Similarly, higher rates of skin cancers have been recently self-reported for World War II servicemen stationed in the Pacific (Ramani & Bennet, 1993).

It has been reported that participation in combat may lead to over-reporting of symptoms in American Vietnam veterans (Hyer, Fallon, Harrison, & Boudewyns, 1987). Contrary findings were reported from the Israeli Army that participation in combat per se may not lead to physical illness, whereas higher reports were associated with combat stress reactions (Solomon & Mikulincer, 1987). This thesis research suggests that both may be correct, but for different reasons. Higher combat was associated with chronic ulcer, as reported elsewhere (Goulston et al., 1985; Tennant et al., 1986). Musculoskeletal disorders may also be associated with the physical rigours of combat training and combat conditions. It is also possible that combat exposure, taking place mainly in tropical rural areas, might be a proxy for exposure to conditions facilitating infective and parasitic disease. This has been found in other South East Asian veterans of World War II (Goulston et al., 1985; Pelletier, 1984; Tennant et al., 1986). Exposure to other persistent fungal infections may explain the relation of a number of other deployment factors with skin conditions. Alternatively, skin conditions may be a manifestation of psychological conditions arising from combat exposure (Solomon & Mikulincer, 1987). The relationship of combat to mental conditions is to be expected given what is known about combat and psychological disorders (Card, 1983; Centers for Disease Control, 1988d; Egendorf, Kadushin, Laufer, Rothbart, & Sloan, 1981; Goldberg, True, Eisen, & Henderson, 1990; Jordan et al., 1991; Kulka et al., 1990b; Snow, Stellman, Stellman, & Sommer, 1988). An increased propensity to complain as a result of mental disorders

attributable to combat, however, is not consistent with the lack of observed relationship of combat with the majority of disease classes.

The differential associations of the two measures of combat may indicate that these are not measuring the same underlying construct. The assumption that being posted to a combat unit is a proxy for combat exposure does need to be qualified. For example, being posted to a combat unit during one's tour in Vietnam would, in the early and latter parts of the war, not necessarily have led to combat and vice versa. For the Australian forces in Vietnam, the conflict proceeded through various stages of danger between 1964 and 1972, (Forcier et al., 1987; McNeil, 1972) and roles varied for individual soldiers within postings. Whatever the danger, combat postings and their associated preparation would be associated with explosives and gunfire, hence the association of deafness with posting and with combat exposure. Thus we conclude that combat exposure has not increased self-reports of recent or chronic conditions except due to factors associated with, but not necessarily caused by combat.

In the Vietnam veterans health study conducted subsequently by the Department of Veterans' Affairs, self-reported prevalences were even higher than those expected from comparable community studies. In this study, 40,030 veterans completed questionnaires from 49,451 veterans surveyed. Many conditions were reported at more than twice the expected number from comparable community studies. These results tend to validate the results of the smaller but more detailed AVVHS study. Even allowing for some over-reporting, these results give grounds for concern and are indicative of serious adverse health effects of Vietnam service. As the DVA report states, "Confirmation would provide strong evidence that there are causal agents arising from military service and in

particular Vietnam service that have had an adverse health effect in Vietnam veterans and their families" (Commonwealth Department of Veterans Affairs, 1998) (p72).

3.5.1 SO WHAT?

The findings of this chapter, were that veterans self-report higher levels of morbidity across a wide range of health problems. Higher levels of self-reported combat exposure were also found to be associated with higher morbidity in several conditions. The self-reported combat exposure measure was partially confirmed by the reliable but relatively poor proxy for combat exposure of posting to a combat unit. This measure was also associated with higher morbidity in a number of conditions.

Now if the self-reported higher prevalence of morbidity observed in veterans were indeed associated with 'real' illness, we would expect to find veterans generating higher healthcare consumption costs than community peers. The availability of self-report data on healthcare consumption from both veterans and men of similar age in the community enabled an examination of this issue. In doing this, we defer examination the question of the validity of the self-report data on healthcare consumption until Chapter 7.

In order to generalise the findings from veterans, we also need to raise the question of whether any additional healthcare consumed by veterans is attributable only to their worse health state. For example, it is also possible that veterans' experiences or their status in the community may make them atypical as healthcare consumers. These questions are discussed in the next chapter.

4 CHAPTER 4: DO VETERANS USE MORE HEALTHCARE?

".. if you want to be able to recruit people for armed service when needed, the way past veterans were cared for is of crucial interest".

(A veteran)

4.1 CHAPTER 4 ABSTRACT

To examine the assertion that veterans are abnormally high consumers of healthcare, we compared the healthcare consumption of Vietnam veterans and age-sex matched peers in the community. Data were available on self-reported healthcare consumption from an epidemiological study of 641 Vietnam veterans. Comparison data were from 11,468 age and sex matched general community peers surveyed in the Australian Bureau of Statistics (ABS) National Health Survey. The ABS National Health Survey questionnaire was administered to both subject groups in the same time period. The healthcare consumption measure was the estimated cost of the healthcare services that the subjects self-reported using. The health status measure was the number of diagnoses self-reported by the subjects. The groups were compared on healthcare consumption by regression analysis to allow age and number of diagnoses to be controlled.

This analysis also provided dollar estimates of fortnightly cost differences between the groups. An increase in 5-year age group was associated with increased healthcare consumption ($3.50 per fortnight, $p<0.05$). Each additional diagnosis added $30 per fortnight ($p<0.001$). A simple comparison of the two samples showed that veterans reported more diagnoses and consumed more healthcare than general community peers. However, when age and diagnoses were controlled, veterans did not consume any more health services than community controls. It was concluded that veterans' consumption of healthcare is no higher than that of their community peers when their worse health is taken into account. This observation should be of interest to both providers of healthcare for veteran groups and also as an indicator of the effectiveness of the current co-payment policies of the Australian Government.

4.2 INTRODUCTION

Popular commentaries which, in an extreme form, are exemplified by Whiting's book 'Be In It Mate' (1969), have portrayed veterans as excessive consumers of healthcare services. These preconceptions that, it could be argued, are based on a few extreme examples of 'old diggers' who are high healthcare users, are sometimes transferred to more recent veterans. They also sometimes lead to the suggestion that, in a community which provides universal health services, the provision of a dedicated healthcare entitlement arrangement for veterans has provided an unwarranted incentive for disproportionate service use by this community group.

Against this is the view that Australia has the responsibility to provide superior healthcare to its veterans, particularly those veterans whose defence service was not voluntary. This is recognised by the Commonwealth's accepting a special obligation to the veteran community as part of the Commonwealth' s defence commitment (Baume et al., 1994). The particularly damaging effects of war service on health are also acknowledged by many studies, (e.g. (Decoufle et al., 1992; Kulka et al., 1990b)). A detailed comparison of the health status between Vietnam veterans and the general population was provided in Chapter 3 and the published paper from the Australian Vietnam Veterans Health Study (AVVHS) (O'Toole et al., 1996b).

However, the question remained: Allowing for the state of their health and their consequent need for health services, are veterans higher consumers of healthcare than the general population? The opportunity to investigate this issue arose from the availability of the health service consumption data from the AVVHS, (O'Toole et al., 1996a) and the Australian Bureau of Statistics (ABS) National Health Survey (Australian Bureau of Statistics, 1991b).

The aim of this analysis was to compare health consumption levels in veterans with those in the general population after controlling for the effects of age and number of diagnoses. The hypothesis examined in this Chapter was that after controlling for health and age, veterans are higher consumers of healthcare than the general population.

4.3 METHOD

4.3.1 SUBJECTS

The 641 subjects examined in this analysis were 641 Vietnam veterans interviewed from a random non-clinical sample of 1000 veterans. Details of response rates for the interview are provided in Chapter 2. The data from the 641 veterans' interviews on the ABS89 health survey were merged with the unit record data from the 11,468 males between 35 and 70 in the ABS89 data set. The ABS subjects were also randomly selected from the community (Australian Bureau of Statistics, 1991b).

4.3.2 DEPENDENT VARIABLE

The dependent variable of healthcare consumption was calculated from subjects' reports in the ABS health interview on seven types of health services used. These services were weighted according to the scheduled fee (Commonwealth Department of Community Services and Health, 1990) or average cost in 1991/92 values (Australian Institute of Health and Welfare, 1992), (Cooper-Stanbury, Solon, & Cook, 1994). Further details of the weightings used are included in Appendix 2.4.

4.3.3 PREDICTOR VARIABLES

The current indicator of health-state was the number of diagnoses reported in the ABS survey. Age at time of interview was also included as a predictor factor within the model, because age has been identified as a predictor health service use after adjustment for illness state. (Hibbard & Pope, 1986; Kouzis & Eaton, 1998; McCallum et al., 1994a). This was measured in five-year steps.

4.3.4 ANALYSIS

Healthcare consumption levels were compared for veterans and general community peers matched for age and health status. Mean healthcare consumption was compared within age cohorts between veterans and community males. A similar comparison was made of means within subgroups that self-reported the same number of diagnoses. Finally, a regression analysis compared the relative effects of veteran status, age and health problems.

4.4 RESULTS

4.4.1 VETERANS WITH COMMUNITY PEER COMPARISONS

Table 4.1 Comparison of healthcare consumption between veterans and the community age cohort

Age group	40 to 44 YRS		45 to 49 YRS		50 to 54 YRS		55 to 59 YRS		60 to 64 YRS	
Sample	ABS	AVVHS	ABS	AVVHS	ABS	AVVHS	ABS	AVVHS	ABS	AVVHS
Mean healthcare consumption ($)	34.88	77.55*	39.42	59.83	49.29	54.00	77.30	53.18	83.58	89.11
Std dev	137.32	287.42	177.80	86.51	269.00	52.72	436.78	49.13	426.94	92.29
Cases	1965	315	1567	239	1269	56	1210	33	1132	29

* $p<0.001$

When examined by five-year age cohorts as shown in Table 4.1, the younger group of veterans (aged 40 to 44 years, n=315) appeared to consume much higher levels of healthcare ($77.55 fortnightly) than their community counterparts ($34.88 fortnightly). This consumption difference was significant when examined by a t test ($p<0.001$, Levene's test for equality of variances $F=27.4$, $p<0.001$). However, mean consumption of the veteran and community samples converged in older age groups. None of the other

age groups displayed a significant difference between veterans and community males in mean healthcare consumption.

High outliers and/or non-users of services were included in the calculation of means to fully represent all reported costs when used in the modelling. As already mentioned, the mean values produced then have to be interpreted carefully if used as comparison standards at the individual level. For 'typical' consumers, the means were skewed by the 250 highest consumers (2%) who account for 41% of the total reported costs, while 24% of subjects used no services in the reporting period, producing high variability in each group (Figure 4.1).

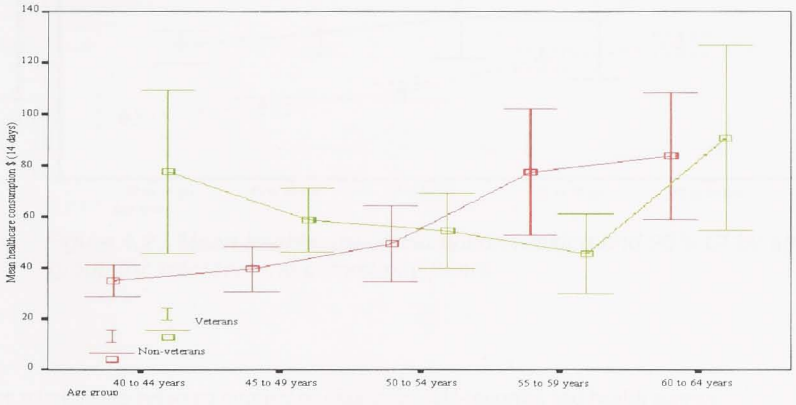

Figure 4.1 Mean healthcare consumption ($) and 95% CI by age group – veterans and community peers

The skewing effects of these atypically high cost healthcare consumers and non-users were then contained by ranking cost of services into four levels (lowest quartile =1 and highest quartile = 4) and comparing the mean rank between veterans and community

males. The difference in the mean consumption measure for the younger veterans was reduced by this transformation, indicating that outliers may well have contributed disproportionately to the higher mean consumption in the younger veteran group. Unexpectedly, it also evened out the large community sample so that veterans' healthcare consumption measured on this scale became consistently marginally higher across all age groups compared to the community (Figure 4.2).

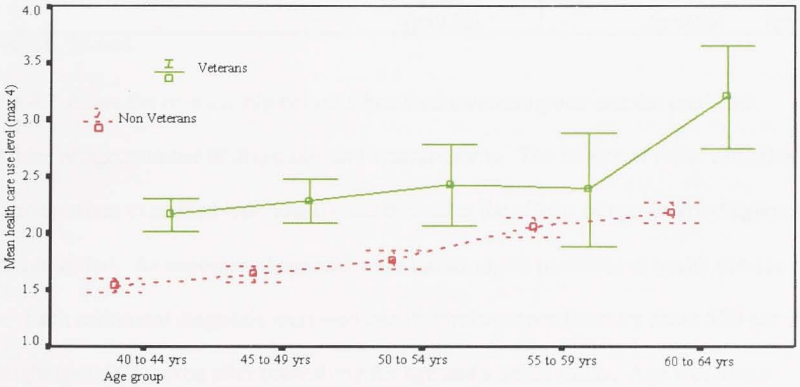

Figure 4.2. Mean healthcare consumption ranking and 95% CI by age group for veterans and community peers

The relationship between number of diagnoses self-reported and health service consumption showed a general linear relationship when examined graphically (up to 6 diagnoses after which the number of subjects became small). No difference was evident between veterans and community peers with similar numbers of health problems.

Table 4.2 Regression analysis of predictors in community and veteran samples combined

Predictors of Cost of Health Services Used	Individually	Controlling for age	Controlling for physical health	All three variables in model
Variable	Coeff ($)	Coeff ($)	Coeff ($)	Coeff ($)
Age in 5 year intervals	8.97**		3.48*	3.53*
Physical diagnoses	31.50**	30.02**		29.96**
Whether veteran	12.03 (p=0.32)	23.13*	0.57 (p=0.96)	5.03 (p=0.68)

** p<0.001 *p<0.05

Table 4.2 shows the relationship between healthcare consumption and the predictor variables of age, number of diagnoses and veteran status. The effects of these variables are shown when examined individually and then after the effects of age and/or diagnoses were controlled. As expected, diagnoses were the strongest predictor of health service cost. Each additional diagnosis increased health service expenditure by about $30 per fortnight ($p<0.001$), even after controlling for age and veteran status. Age was also a significant contributor ($9 per five-year increase, $p<0.05$). It was only in the one age group mentioned above where veterans were found to have significantly high healthcare consumption. This group also self-reported higher numbers of health problems.

The increase in coefficient for the relationship between veteran status and healthcare consumption ($12.03, $p=0.32$) when age was controlled ($23.13, $p<0.05$) is consistent with veterans using healthcare at a higher rate than their community peers of the same age do. However, when, taken over all the subjects, veteran status alone was not a significant predictor of healthcare services used. After number of diagnoses was

controlled, not only was there no significant relationship between veteran status and higher health service consumption, the beta coefficient ($0.57, p=0.96) was close to zero suggesting no such relationship would be found even if sufficient data were available to achieve a significant coefficient.

4.5 DISCUSSION

The study data suggest that veterans are not higher users of health services once allowance is made for their poorer health. Further, no evidence was found that there are more atypical high health service users among veterans than in the general population.

In considering the trends indicated by this analysis, it should be noted that these findings are based on aggregated data. These 'untrimmed' results are of most value as indicators of effects on the health service as a whole. They are thus appropriate as guides for formulation of priorities for preventive interventions, and planning of services for emergency and defence personnel after deployments. However, caution should be exercised in applying these observations as indicators of 'typical' individual service consumption patterns at an individual case level. Nevertheless, the estimates remain unbiased for the aggregated cases.

A number of issues arise in identification of factors predicting healthcare consumption. The first issue to be considered is the normal effect of aging on use of healthcare services and its interaction with the presence of other variables measured, in particular veteran status. It was found that the random sample of male veterans appeared to use more healthcare services than age-matched men in the general community. However, where this occurred, it was because they tended to have more health problems. This observation

addresses concerns about potential over-servicing of veterans because of easier access once entitlement to totally free healthcare is available.

In the present analyses, the utilisation data are self-report and retrospective. While a short, recent reporting period was used to minimise recall bias, patient reports could be affected by selective remembering based on the importance and significance attributed by the subject to the recalled event (Carsjo, Thorslund, & Warneyd, 1994; Kehoe, Wu, Leske, & Chylack, 1994). Over-reporting of health service usage may prevail for people seeking to maximise the reported severity of their illness for compensation purposes or to obtain sympathy/attention as with the problem of hypochondriasis (Kreitman, Sainsbury, Pearce, & Costain, 1965). We may also hypothesize under-reporting for patients wishing to hide, deny or avoid dealing with their disease (Hamada, Chemtob, Sauter, & Sato, 1988; Horowitz, 1986; Strauss, Spitzer, & Muskin, 1990). This may also be the case in people who fear some adverse career effect if an employer were to learn of a health problem or in stoical people not wanting to give up time from other pursuits to deal with their disorder. None of these potential reporting biases are likely to be more influential in veterans than in the general population.

A number of questions on the measurement effects observed need to be followed up. These include the determinants of the large variability of health service costs in both the ABS sample and the veteran sample. Further investigation of the component parts of the total cost is needed, particularly covering a larger time frame than the two weeks report that was available for this analysis. Particular attention might be paid to whether there is a qualitative difference in the predictors of admission to hospital, use of specialist

services, use of GP services, use of allied health practitioners, and pharmaceutical consumption.

Only the use of a longer time frame could be addressed within the scope of this thesis. These data, covering an extended time frame, were available only for medical services. This question of how veterans' healthcare consumption patterns compare over a longer period of observations is examined using a one-year data extract of HIC and DVA claims data in Chapters 6 and 7.

Veterans' healthcare services are negotiated by the Department of Veterans' Affairs (DVA) directly with providers. Both the private and public providers deliver hospital and community services to veterans by arrangement with DVA. Services obtained through this system are completely without charge to veterans, unlike the rest of the community for whom only some of the medical services are bulk-billed and are therefore free at point of delivery. These arrangements also apply to pharmaceuticals prescribed for veterans. Therefore, veterans who are entitled to use DVA-funded services do not have the co-payment disincentive against overuse that is present for the non-veteran community. It follows that, if the co-payment imposed on the community without DVA entitlements is working as an overuse disincentive, the non-veteran community should be consuming less healthcare per capita than veterans. This effect could not be demonstrated by these data or, if present, veterans for some compensating reason are simultaneously using fewer services.

4.5.1 SO WHAT?

Our findings are inconsistent with the preconception that veterans are higher users of health services simply because they are veterans. The relationship between use of services by veterans and their worse health was clearly demonstrated. When this is taken into account, veterans' consumption of healthcare is no higher than their community peers. This finding does not support the view that the co-payment required from the general community has any measurable value in controlling demand for healthcare. The findings reported in this chapter were published in the magazine Health Cover (Marshall, Jorm, Grayson, & O'Toole, 1998a) where the implications for the Federal Government's co-payment policy were highlighted. The article and magazine editorial comment are reproduced at Appendix 4.1.

This chapter has compared the healthcare consumption of veterans with men of similar age in the general population. The findings demonstrated that their use of healthcare is similar once the veterans' worse health state is controlled. Given this, we can be more confident in using veterans healthcare consumption patterns as an indicator of general population behaviour. With this in mind, we can now turn to the relationship between the veterans' healthcare consumption and various predictors including physical and mental health status. These relationships are examined in the next two chapters.

The ABS Health Study was used in this chapter for comparison with the AVVHS data. However, large-scale population surveys such as ABS Health Study do not contain the large range of health and psychosocial variables that can be brought together by more focused studies such as the AVVHS. Nor are they routinely linked to administrative data on healthcare utilisation to provide a measure of 'actual' vs self-reported healthcare

consumption. The AVVHS data were therefore used for the analyses in the next two chapters.

5 CHAPTER 5: SELF-REPORTED HEALTHCARE CONSUMPTION IN VIETNAM VETERANS: PTSD AND OTHER FACTORS

Indeed, extraordinary events (like combat exposure) and reactions to them require extraordinary (healthcare) efforts, both by the client and the clinician.

(Scurfield, 1985)

5.1 CHAPTER 5 ABSTRACT

In the preceding analyses it was demonstrated that their higher reported number of diagnoses explained higher healthcare consumption of Vietnam veterans. The thesis research then sought to identify and measure relationships between a number of factors including post-traumatic stress disorder (PTSD) and healthcare consumption. 74 variables were examined from questionnaire data, service records and clinical histories collected on 641 randomly selected Australian Vietnam veterans. Variables were examined by univariate linear regression and then grouped into seven blocks of related variables for examination of the relative contributions of age, physical and mental health, predisposition, deployment experiences and repatriation.

The presence of a diagnosis of PTSD was associated with an additional cost of $102 in self-reported healthcare consumption for the two-week reporting period. This effect was reduced once physical health was controlled. Each physical diagnosis was associated with an average cost of $35. Alcohol consumption was found to be unrelated to healthcare consumption. Other variables associated with healthcare consumption were general mental health status, particularly depression, educational status and the quality of the veterans' social supports during and after deployment. The complex relationship of PTSD and poorer physical health with healthcare consumption is compatible with a strong interrelationship. It is also compatible with a tendency to somatisation of PTSD symptoms, which has been described in the literature. Whatever the causal relationships, more work is warranted on preventive measures to reduce PTSD morbidity. Such efforts relate to both duty of care and the efficient management of health services. Significant health service costs are associated with poorer repatriation experiences. This may indicate potential value in greater efforts to provide for homecoming welcome and reintegration of returning veterans.

5.2 INTRODUCTION

5.2.1 BACKGROUND

About half of Australia's 50,000 Vietnam War service personnel were conscripted. During the course of Australia's commitment, the war effort and conscription became increasingly unpopular at home. This presented the returning veterans with an ambiguous environment for recovery from the physical and mental traumas experienced.

There are special challenges to delivering veterans' healthcare services in such an environment. However, as both the Australian Defence Force and Repatriation system provide comprehensive health services to their members, a wealth of information can be elicited from clinical and administrative records on patterns both of morbidity and healthcare consumption for these groups. Some of the lessons learned may be generalisable to other traumatised populations.

War veterans form a community group, which has special physical and mental healthcare needs. War veterans also comprise a group to which the community has a particular duty of care, especially if the military service in which the group engaged was not voluntary. Health effects of defence service have been examined elsewhere and it has been demonstrated in many studies that such service takes its toll on the physical and mental health of those who participate (Kulka et al., 1990b; O'Toole et al., 1996b; Ward, 1995). This is particularly so for post-traumatic stress disorder (PTSD) (O'Toole, Marshall, Grayson, & Schureck, 1995).

In evaluating the effectiveness of healthcare services, both help-seeking and utilisation have to be considered. In an earlier paper, (Marshall et al., 1997) we examined factors associated with 'help-seeking' defined as veterans' having claimed to be suffering from a condition related to their service in Vietnam and been accepted by the Department of Veterans' Affairs (DVA). This paper is reproduced at Appendix 5.1.

Seventy-three measures of health and welfare status were examined in six blocks of related variables and particular attention was given to PTSD. (Current age was not included in that analysis as a predictor of help-seeking because the dependent variable spanned a twenty-year period. Current age was therefore not seen as a relevant predictor

of a help-seeking action, which could have occurred anytime in that period). It was found that although veterans suffering from PTSD were more likely to seek help from DVA, over one third of veterans suffering war-related PTSD had not secured entitlement for DVA treatment for that or any other condition in the twenty years since their Vietnam service. Other factors associated with help-seeking from DVA were combat exposure, time in the services, and social support during and after deployment.

In this Chapter, we consider the question of whether similar variables that predict help-seeking also predict healthcare consumption. The variable chosen as a measure of healthcare consumption was the estimated total cost of healthcare that each subject reported they had used. Most healthcare is focused on treatment of specific illness or diseases. Therefore, we could expect that those with the most physical and mental health problems would consume the most healthcare. Based on this logic, a starting hypothesis might be that disease severity or complexity should determine healthcare consumption. However, many investigations have shown that other demographic, psychological and social factors such as adverse life events and availability of social support also influence people's use of healthcare (Lindstrom, Hagman, & Bengtsson, 1995; Thornicroft, 1991; Wenzel et al., 1995).

5.2.2 PTSD AND HEALTHCARE CONSUMPTION

PTSD as defined by the Diagnostic and Statistical Manual of the American Psychiatric Association (1994) is characterised by symptoms that meet six criteria:

A. Exposure to a traumatic event

B. Persistently re-experiencing the event in an intrusive way

C. Persistent avoidance of stimuli associated with the trauma and numbing of general responsiveness

D. Persistent symptoms of increased arousal

E. Duration of the disturbance of more than 1 month

F. Disturbance causes clinically significant disturbance or impairment in functioning.

Clearly behaviours related to such a disorder are often difficult to differentiate from similar behaviours when they occur in the absence of PTSD. Therefore, such measures as often thinking about Vietnam (cf PTSD criterion B), getting into fights over Vietnam (cf PTSD criterion D) and so on would be expected to have a high covariance with PTSD even though they can occur quite independently.

It has also been observed that PTSD has correlated moderately with other mental health disorders such as depression and anxiety (Grayson, Dobson, & Marshall, 1998; Kessler et al., 1995; O'Toole, Marshall, Schureck, & Dobson, 1998). These comorbidities would therefore be expected to covary with PTSD in their association with healthcare consumption (Kessler RC, 1999).

For these reasons, in analysing the relationship between PTSD and healthcare consumption, the design of the regression described below fitted PTSD individually and then after controlling only for age and physical health since these two blocks were relatively free from major overlap with the PTSD diagnostic criteria. Nevertheless, some covariance with physical health was expected because of the previously identified somatisation of PTSD related symptoms (McFarlane, Atchison, Rafalowicz, & Papay,

1994). The remaining mental health diagnoses were then examined both individually and together in the mental health block to enable an assessment of the combined relationship of the mental health block factors with healthcare consumption.

Similarly the relationship between healthcare consumption and psychosocial factors in the blocks labeled predisposing risk factors, deployment factors, repatriation and exservice involvement factors were examined, first individually and then controlling only for age, physical and mental health factors. The model was then fitted as a whole, partly for interest in which variables remained significant predictors with all others controlled, but mainly as a means of measuring the variance accounted for by the model with all of the blocks fitted together.

5.2.3 AGE AND HEALTHCARE CONSUMPTION

Age was found in the previous chapter to be predictor of healthcare consumption with both physical health and veteran status controlled. It has also been found to be associated with healthcare consumption in other studies (Hibbard & Pope, 1986; Kouzis & Eaton, 1998; McCallum et al., 1994a). Other studies have found that adverse life events are associated with earlier onset of disorders such as depression consumption (Brown, Harris, & Hepworth, 1994; Stansfeld, Smith, & Marmot, 1993). This would be expected to bring with it a corresponding increase in healthcare for these groups. For these reasons it was considered important to control for age early in the regression model development and it was therefore fitted to the model before physical and mental health variables in the model 2 described below.

5.2.4 CURRENT RESEARCH ON HEALTHCARE CONSUMPTION

Considerable research and development efforts in health service management are being focused on identifying factors related to healthcare consumption. This relationship is of particular interest in obtaining maximum value for health expenditure. The healthcare consumption related to particular disorders has been costed in a number of studies (Andrews et al., 1985; Johnson, Weissman, & Klerman, 1992; Mellis, Peat, Bauman, & Woolcock, 1991; Mor, Fleishman, Dresser, & Piette, 1992). Casemix classification development has sought to classify patients by their clinical characteristics into groups which are resource homogeneous (Commonwealth Department of Human Services and Health & DRG Development Section, 1995; Health Care Financing Administration & 3M, 1994). Health economics concentrates research on the costs and benefits of particular approaches to disease management (Glass & Goldberg, 1977; Huang, Cartwright, & Hu, 1985). Official studies of the costs of providing hospital care are further examples of interest in identifying costs of particular types of healthcare provided to specific consumer groups (Australian Bureau of Statistics, 1995; Cooper-Stanbury et al., 1994).

Identifying the total healthcare resources used in relation to particular disorders, and how other consumer characteristics influence such consumption, has immediate application in health service management and planning. Also, at an individual patient level, norms developed may (with appropriate care in relation to skewing effects of atypical cases) suggest whether a patient has needs not directly related to the disorder presented, but which influence healthcare consumption. Other services such as education, counselling,

income support or welfare interventions, may more effectively address needs not related to health problems.

5.2.5 AIMS AND HYPOTHESIS

For war veterans, there are particular variables that we may relate to both health status and healthcare consumption. These include age at deployment, exposure to combat (in terms of both recency and intensity), the presence of injuries or other physical illnesses, the subjects' attitudes and the availability of social supports (Blaume, Liang, & Liu, 1994; McCallum, Simons, Simons, & Wilson, 1994b; Wolinsky, 1994).

The primary aim of this analysis was to examine the relationship between the number and severity of veterans' physical and mental health problems and their healthcare consumption levels. We also examined how other factors influence this relationship. At the individual disorder level, we gave PTSD a particular focus. PTSD was also examined as an individual predictor after controlling for age and physical health status.

The hypothesis examined in this Chapter was that after controlling for physical health, healthcare consumption would be related to mental health, quality of repatriation and social supports available to the veterans. The suggested relationship between these factors is shown in Figure 5.1.

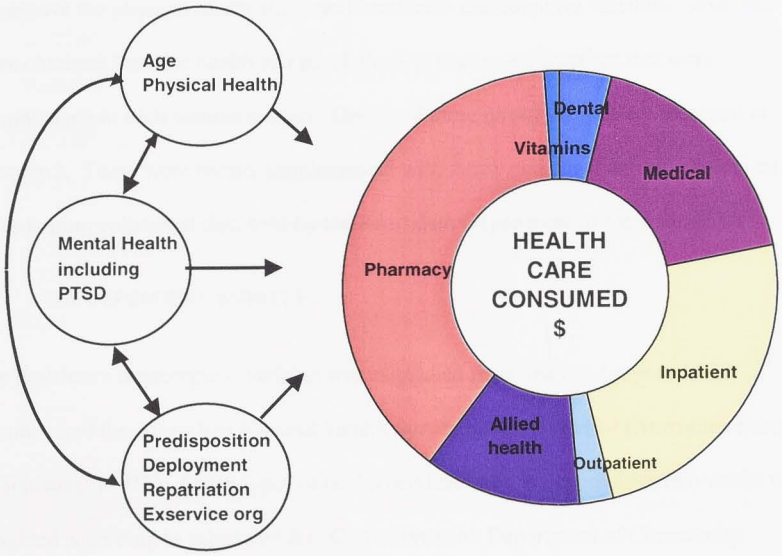

Figure 5.1 Hypothesised relationship between predictor variables and self-reported healthcare consumption

5.3 METHOD

5.3.1 SUBJECTS

The subjects for this analysis were the 641Vietnam veterans sample from a random sample of 1000 described in Chapter 2 (O'Toole et al., 1996a). The larger ABS community sample was not suitable for this analysis because the analysis required the more detailed set of variables available only in the veteran sample.

5.3.2 DATA

Except for the physical health status and healthcare consumption variables, most data were obtained from the health and psychological state questionnaires that were administered to each veteran subject. Details of these questionnaires are provided in Chapter 2. These were further supplemented with Army personnel and psychological records from enlistment data held by the Australian Department of Defence.

5.3.3 THE DEPENDENT VARIABLE

The healthcare consumption variable was calculated from veterans' reports when administered the Australian National Health Survey health interview (Australian Bureau of Statistics, 1991b). Seven types of health services used in the previous two weeks were weighted according to scheduled fee (Commonwealth Department of Community Services and Health, 1990) or average cost in 1991/92 values (Australian Institute of Health and Welfare, 1992; Cooper-Stanbury et al., 1994). The weightings to estimate the value of each of the services are shown in the Appendix 2.4.

Subjects' occasions of service were weighted to calculate their dollar cost and then summed to estimate the total cost of healthcare consumption for each subject in the two weeks preceding the interview. High users were retained in the calculations of the means, leaving potentially large effects on overall service provision estimates from the few highest users. Therefore the main value of the cost estimates is at the aggregate level which retains the effects of the small but important group of large-scale consumers.

5.3.4 PREDICTOR VARIABLES

Seven blocks of related measures were examined. Variables, which are described in Chapter 2, were grouped into blocks on the basis of their relationship to the model in the hypotheses. The first three blocks index:

- **Age** (one variable) at time of interview measured in five-year intervals.
- Current **physical health** (2 variables of 3 examined) and
- **Mental health** (6 variables of 15 examined).

The next two blocks grouped variables that describe more psychosocial risk factors. They are:

- **Predisposition** (10 variables of 22 examined) contains variables that are indicators of pre-existing vulnerability,
- **Deployment** (5 variables of 14 examined) contains variables that indicate exposure to trauma and other health risks on deployment

The next two blocks provide views of the quality of the veterans' homecoming and repatriation after deployment

- **Repatriation** (9 variables of 14 examined) contains variables related to the quality of homecoming and repatriation after deployment.
- **Exservice involvement** (4 variables of 5 examined) contains variables that measure the veteran's membership of exservice associations and involvement with other veterans.

Of the 74 variables described in Chapter 2 and listed in full in Appendix 2.2, 37 were omitted from the regression model because of their collinearity with variables chosen or because they were actual linear functions of the variables which were included.

5.3.5 ANALYSES

A univariate linear regression approach was taken in examining the relationship between the predictor variables and the healthcare consumption endpoint. The unstandardised beta coefficients generated by these regression analyses could then be interpreted as $ costs generated by the factors concerned firstly individually and then with selected blocks of other factors 'held constant'. The following order of fitting blocks of variables and individual variables to the regression models was followed for this analysis and those in subsequent chapters.

5.3.5.1 Fitting of variables to the regression models

The order of fitting blocks of variables to the models was selected according to the relationships between the variables discussed at 5.2.2 above. In particular the relationship between PTSD and healthcare consumption was to be examined. The regression models used to examine the relationships between the factors are outlined in Chapter 2 and displayed in Table 2.1 (page 37).

When examining variables individually and with blocks of other predictor factors controlled, four models were used:-

- All 37 variables were first examined individually (Model 1). This enabled the relationship between healthcare consumption and PTSD to be identified with all other variables free to covary.

- The relationship of each variable to healthcare consumption was also examined after controlling for age and physical health (Model 2). This model is represented by the equation:

  Cost = f [Age (1 variable) + Physical health (2 variables) + {One variable at a time from the remaining blocks}] + residual

  This is the key model because it is addressing the costs associated with PTSD and other mental health disorders above and beyond age and physical co-manifestations and allowing related psychosocial factors to co-vary.

- The variables in the last four blocks representing predisposition, deployment and repatriation social support risk factors were then fitted to the model with age, physical health and mental health controlled (Model 3). This model is represented by the equation:

  Cost = f [Age (1 variable) + Physical health (2 variables) + Mental health (6 variables) + {One variable at a time from the remaining blocks)] + residual

  This enabled any relationship between healthcare consumption and the predisposition, deployment and repatriation variables to be examined with the physical and mental health variables controlled.

- All 37 variables selected to provide a balance between comprehensive concept representation and minimum collinearity were then all fitted to the regression model (Model 4). Cost = f [ALL variables fitted together].

This enabled measurement of the variance accounted for by the model with all blocks of variables fitted.

5.3.5.2 *Sequence of examining blocks of variables*

In this next series of multivariate analyses, only complete blocks of factors were used. The R^2 statistic was used as a measure of the variance accounted for by each of the blocks of variables as they were fitted in the following sequence.

The seven blocks of factors were each examined in a linear regression model to assess the variance accounted for by each block of variables both individually (Step 1). They were then fitted in combination with other blocks, for examination as predictors of the subjects' healthcare consumption with age, physical and mental health and finally all other blocks controlled (Steps 2 and 3).

In Step 2, each of the last four blocks was fitted to the model with the age and physical and mental health blocks, and variance effects of alternative combinations were observed. This analysis identified which groups of factors were most highly related to healthcare consumption, and to what extent the last four blocks of factors were distinct from age/health-status in their effects. Finally, in Step 3, the variance accounted for by each block was examined with all fitted to the model.

5.4 RESULTS

5.4.1 EXAMINATION OF INDIVIDUAL VARIABLES

Table 5.1 Results of regression models examining 37 variables individually and fitted together as predictors of self-reported healthcare consumption in Vietnam veterans

Predictors	High Score	Univariate (Model 1) Coeff ($)	Age & Physical Health Controlled (Model 2) Coeff ($)	Age, Physical & Mental Health Controlled (Model 3) Coeff ($)	Full Model (N=464) (Model 4) Coeff ($)
1. Age					
Age in 5 year intervals	Older				
2. Physical Health					
Each veteran high risk diagnosis	Diagnoses	39.82 **	36.57 **	31.56 **	27.32 **
Each veteran low risk diagnosis	Diagnoses	34.31 **	32.49 **	27.17 **	23.96 **
3. Mental Health					
Level of depression (20 points)	Depressed	13.26 **	11.31 **	12.71 **	12.13 **
Marital dysfunction (32 points)	Symptoms	3.92 *			
PTSD current diagnosis (0-1)	Present	102.49 **	72.46 *		
Total phobia symptoms (max 5)	Symptoms	10.91 **			
Lifetime alcohol symptoms (max 9)	Symptoms				
Level of anxiety (0-10)	Anxious	17.67 **	12.78 **		
4. Predisposition					
Measured intelligence level (scale 1-20)	Hi Intel				
Personality self orientation symptoms (max 7)	Symptoms				
Antisocial personality indicators (max 10)	Symptoms				
Personally reluctant to go to Vietnam (0-1)	Anti				
Significant others opposed deployment (max 3)	Anti				
Personally committed to Vietnam war (0-1)	Pro	72.89 *			
Felt ill-trained or prepared (0-1)	Problems				
Educational difficulties (0-3)	Problems	52.32 **	42.05 *	39.68 *	42.04 **

Age at start of first deployment	Older				
Non-combat stressors during deployment (max 14)	Hi Stress	13.83 *			
5. Deployment Profile					
Deployed alone and not with a unit (0-1)	Alone				
Combat incident exposure (max 21)	Hi Combat	5.47 **			
Combat role of unit (max 13)	Hi Combat				
Disciplinary charges during service	More				
Years service experience pre-Vietnam	Longer				
6. Repatriation					
Pleasure in leaving Vietnam (max 2)	Positive	-31.10 *			
Amount talked about Vietnam 1st six mths (max 5)	More Talk				
Experience of discrimination over deployment (0-1)	Often	62.18 *			
Reluctance to reveal veteran status (max 4)	Often				
Arguments/fights over Vietnam involvement (max 2)	Often	39.18 *			
Often think about Vietnam (0-1)	Often	133.20 **	78.61 *		
Anger at others over Vietnam (max 2)	Often	31.66 *			
Shame over Vietnam service (0-1)	Often				
Gladness of others at return (0-6)	Not Glad	29.38 **	25.33 *	24.69 *	23.09 *
7. Exservice Organisation Membership					
Active in Returned & Services League (max 2)	Active				
Active in Vietnam Veterans Association (max 2)	Active	21.31 *			
Active unit association member (max 3)	Active				
Closeness with other veterans (max 7)	Closer				

N=641 *=p<0.05 **=p<0.001
(Only those coefficients where a significant relationship was detected were reported)

Table 5.1 lists the 37 factors examined in a full regression model for their influence on healthcare consumption. Their univariate relationship with healthcare consumption is also shown before and after the effects of physical and mental health were controlled.

5.4.1.1 *Age and physical health*

No significant relationship between age now and self-reported healthcare consumption was found even though this is usually the case.

For the second block of factors, physical health, a very strong relationship was found between healthcare consumption and diagnoses that are particularly prevalent in veterans (β=\$40, $p<0.001$). This close relationship between health problems and healthcare use was also found (as expected) for those diagnoses for which prevalence is not elevated in veterans (β=\$34, $p<0.001$). This effect indicates that the presence of each veteran high-risk diagnosis added \$40 to the fortnightly healthcare consumption cost, while adding one non-veteran associated diagnosis added \$34.

5.4.1.2 *PTSD and other mental health factors*

For the third block of factors, mental health problems, all except alcohol dependence and abuse symptoms were individually related to healthcare consumption. No evidence could be found for a relationship between the veterans' alcohol abuse/dependence history and their healthcare consumption, even when considered as a single predictor variable.

Without controlling for the effects of other factors, the presence of a clinical diagnosis of PTSD was clearly related to resource consumption. Where PTSD symptoms were currently active, the additional cost of healthcare consumption was \$102 per fortnight ($p<0.001$) (95%CI: \$52, \$153). With age and physical health controlled (model 2), the healthcare consumption cost associated with PTSD dropped to \$72.46 ($p<0.05$) (95%CI: \$22, \$123):. Although the difference was not statistically significant, the effect indicated is consistent with a proportion of the healthcare associated with PTSD being provided for

presenting physical health problems or alternatively, PTSD being more likely or severe in those with physical health problems as well.

This is the most important result of this chapter and the one that directly addresses the key hypothesis. The subsequent models are not relevant to the examination of the healthcare consumption costs associated with PTSD. As discussed above, many of the diagnostic criteria of PTSD are similar in their behavioural effects to the social variables in the predisposition, deployment and repatriation blocks.

The mental health variable that continued to be significantly associated with healthcare consumption in the full model was depression as measured by the CES-D scale. Most of these mental health variables share symptoms or behavioural descriptors. They are also moderately correlated with each other. It is therefore not possible to be specific about the reasons for the loss of significant association of other mental health diagnoses.

5.4.1.3 *Other factors*

Of the predisposition group of variables, educational disadvantage was strongly associated with healthcare use, even after controlling for all other variables. For each point on the three-point educational disadvantage scale (i.e. leaving school early, having been suspended or not having done well), an average cost of $52 was added to fortnightly health costs ($p<0.001$). Non-Vietnam related stressors which occur during deployment were also found to be related to healthcare use on a univariate basis, as were the attitudes of significant others to the veterans' deployment.

Of the deployment group of variables, the intensity of the veterans' combat exposure was found to relate to healthcare consumption. Each point on the 21 point combat scale

added $5.47 per fortnight to the cost of treatment services used by this group of veterans. The other variables of this group were not significantly related to the veterans' consumption of healthcare.

Of the repatriation variables, which relate to the veterans' attitudes and perceived support during their period of repatriation, a number were found to relate strongly to their healthcare consumption. The variable that stands out in this group is whether the veterans think of their Vietnam service frequently. A positive answer to this question predicts an additional use of healthcare of $133 per fortnight ($p<0.001$). Other factors in this group were also associated with higher use of healthcare. They were the veteran's reporting he had been discriminated against because of his Vietnam service (β=$62, $p<0.05$), involvement in fights because of being a veteran (β=$39, $p<0.05$), having felt angry about Vietnam (β=$32, $p<0.05$) and whether significant others were less than welcoming to them when they returned (β=$29, $p<0.05$). The importance of a welcoming homecoming is reflected by this variable remaining a predictor even after controlling for the veterans' physical and mental health (β=$23, $p<0.05$).

The next block of factors, exservice membership, indicates that membership of the Vietnam Veterans Association of Australia is associated with higher use of healthcare (β=$21, $p<0.05$). This is in contrast with membership of the Returned and Services League and Unit associations. However, the relationship of Vietnam Veterans Association of Australia membership with healthcare consumption disappeared after controlling for physical health.

5.4.2 THE MULTIVARIATE MODEL OF BLOCKS OF ASSOCIATED VARIABLES

Table 5.2 Examination of model by reduction in variance of selected blocks of factors

N=641	Individually (Step 1)			Controlling for age, physical & mental health (Step 2)			Blocks fitted sequentially full model (Step 3)		
	df	R^2	p value	df	R^2 chg	p value	Df	R^2 chg	p value
Age	1	0.03%	0.6902				1	0.03%	0.6902
Physical	2	5.78%	0.0000	9	11.84%	0.0000	2	6.22%	0.0000
Mental	6	7.95%	0.0000				6	5.59%	0.0000
Predisposition	10	3.33%	0.0180	10	1.75%	0.2528	10	1.75%	0.2528
Deployment	5	1.65%	0.0598	5	0.40%	0.7263	5	0.58%	0.5276
Repatriation	9	3.50%	0.0071	9	1.49%	0.2984	9	1.44%	0.3240
Exservice	4	0.74%	0.3174	4	0.41%	0.5688	4	0.38%	0.6012
R^2 Sum		22.97%			15.88%		37	15.98%	0.0000

Missing values replaced by means. Using 641 interviewed subjects from random 1000.

Table 5.2 shows the variance (R-squared) accounted for by each of the blocks when considered individually and the increase in variance explained when each block was added to the model already containing the age and physical and mental health blocks. It also shows the increase in variance accounted for when each of the blocks was added sequentially to the model in the order discussed.

When first examined individually, each block of variables was found to contribute at least 1% to explanation of variance. If each of these groups of factors were to be independent of the others, we might look for a total effect of up to 23% R-squared.

Of the seven blocks including age, the largest R-squared was from the mental health group of variables at 8%. The next largest R-squared was from the physical health block of variables contributing 6%. These two groups contributed fairly discrete effects as,

when both were fitted to the model with age, they contributed a combined R-squared of 12%. In the full model, these blocks comprise a substantial proportion of the overall R-squared of 16%.

5.5 DISCUSSION

These results demonstrate that mental health and related social problems are associated with substantial healthcare consumption costs. Although there is some overlap with healthcare consumption costs associated with age and physical health, this appeared to account for only a small proportion of the costs related to PTSD. The key finding was that fortnightly healthcare consumption in the order of $72 was associated with a diagnosis of PTSD after age and physical health was controlled.

Some trends and means may have been strongly influenced by the inclusion of a high 'outlier' healthcare consumer group and those subjects who did not use any services. However, a separate analysis with extreme values removed did not alter the general pattern of associations identified here. As mentioned previously, for health service management, it is the 'untrimmed' results that are of most value in formulation of priorities for preventive interventions, and planning of services for emergency and defence personnel after deployments. They also provide some indicators for further investigation of particular areas of healthcare consumption patterns with larger data sets of actual healthcare consumption records become available on healthcare consumption by this subject group.

The inclusion of a few unusually high consumers in the younger age groups may have partially explained the lack of association between age and healthcare consumption

within this veteran sample. However, it is likely to have been mainly due to the relatively small age range represented in the Vietnam veterans' cohort.

An important negative finding was the lack of a relationship between veterans' alcohol use and healthcare consumption. This contradicts the view that veterans' abuse of alcohol may have been a major contributing factor to their need for services. Moreover, the expected relationship between high alcohol usage and high healthcare consumption often observed in studies of clinical subjects was not found in this community-based sample.

Of possibly greater interest is the extent to which the healthcare consumption effects of other mental disorders are masked by the presence of PTSD (Grayson et al., 1998). Common comorbidities with PTSD are depression and generalised anxiety (Kessler et al., 1995). Therefore, specific measures for these conditions were retained in the regression analysis even though they have a moderate correlation with PTSD. Analysis of mental health problems, which commonly occur in veterans without PTSD, shows that they are not merely part of the PTSD symptom cluster (Grayson et al., 1998). It is therefore important to be able to identify them as distinct diagnoses when present, either alone or as a PTSD comorbidity.

It also appears that a proportion of the additional healthcare used by those suffering from PTSD was at least nominally related to physical comorbidity. In previous research, a strong overlap between PTSD and other symptom clusters has been reported (Kessler et al., 1995). Physical health comorbidities associated with PTSD also account for a proportion of the healthcare consumption singly associated with PTSD. This is demonstrated by the reduction of the cost predictor coefficient that is associated with

PTSD diagnosis when controlling for the effects of physical health. In a separate analysis, the same effect was found for the cost associated with PTSD measured by Mississippi scale. This supports the theory that PTSD and physical health are related. Therefore, the hypothesised separate causal relationships between physical health, mental health and healthcare consumption each have to be examined.

Another potential complication in focusing on the relationship between PTSD and healthcare consumption is the observed somatization of PTSD symptoms. Van-der-Kolk, McFarlane and Weisaeth (1996) have reported that either physical health deteriorates as a result of the PTSD or else PTSD may present in physical symptoms corresponding to the arousal or numbing effects of the disorder. Similar somatization effects have been observed for other mental health problems (Pilowsky, 1997). In examining the data in this analysis, attention was therefore given to ways of identifying the overlap in health consumption effects between mental and physical health measures. The findings of this study are consistent with these effects in that a substantial amount of the relationship between healthcare consumption and PTSD were absorbed when physical health status was controlled. Possible hypotheses to explain this finding include:

- The physical illness is the presenting symptom of PTSD – eg somatisation
- The physical illness takes a different course, eg is more severe, when PTSD is present.
- PTSD causes or predisposes to physical illnesses.
- Physical illnesses causes or predisposes to PTSD

A further issue raised by this analysis is the relationship between social supports and mental health status. This thesis research was not able to conclude how PTSD vulnerability and social support are related because the causal pathways are far from clear. Much of the apparent relationship between social support factors and healthcare consumption disappeared when mental health factors were controlled. Other recent research has also found that social support does moderate healthcare consumption in a similar way to the univariate relationships identified here (Brown et al., 1994; Manning, Jackson, & Fusilier, 1996). That these effects appear to be moderated by mental health intermediate variables does not lessen their importance in presenting issues that warrant attention.

The relationship between educational disadvantage and higher healthcare consumption might be underlain by intelligence. However, while there was a marginal relationship between healthcare consumption and lower intelligence, as measured by the pre-enlistment AGC test, this relationship disappeared when physical health was added. This finding is consistent with an effect of IQ via reduction in health problems. It is therefore likely that the relationship between educational disadvantage and healthcare consumption was a direct effect of acquired information and learned skills rather than ability. Higher education levels may have provided information necessary to make decisions about self-managed healthcare, hence reducing the healthcare consumption. Another explanation is that higher education may be associated with a more affluent lifestyle with better access to preventive healthcare.

The importance of a welcoming homecoming is a particular finding that needs to be considered by those responsible for deployment and repatriation management. If the

additional expenditure remains constant over a 20-year period, the healthcare cost of $29 per fortnight could amount to as much as $15,277 per veteran not welcomed home if the consumption observed were constant over that period. This amounts to a substantial burden on the community without considering other economic costs such as employment effects. This effect survives after controlling for mental health. It is therefore not simply a function of the veterans concerned being generally depressed or demoralised or disturbed. Rather it is more likely to indicate that veterans who did not receive a positive, welcoming homecoming may continue to consume additional healthcare partly to meet their need for recognition of the service they provided during their deployment.

A related issue is the importance of social support on return from deployment, in particular a genuine recognition which is perceived as such by the veterans themselves. The strong relationship between significant others being perceived as less than supportive and higher healthcare consumption after so many years, emphasises the importance of strong acknowledgement of the veterans' service after they return. The relationship between Vietnam Veterans Association of Australia membership and higher healthcare costs is more likely to indicate that the Vietnam Veterans Association of Australia has attracted for its membership those who have a higher need for healthcare.

In the present analyses, the utilisation data are self-report and retrospective. A short, recent reporting period was used to minimise potential biases. Nevertheless, patient reports may be affected by selective remembering based on the importance and significance that the patient attributes to the recalled event (Carsjo et al., 1994; Kehoe et al., 1994).

5.5.1 SO WHAT?

In summary, the major finding of these analyses is that PTSD is associated with substantial self- reported healthcare consumption costs. These costs are in the order of $72 per fortnight over and above those costs that are associated with physical conditions and age. It is extremely difficult to distinguish costs related to any one mental health condition from others because of their intercorrelation.

Veterans with high healthcare consumption costs tended to be characterised by a number of factors. They were more depressed than the lower consumers were and self-reported poorer social support resources. They tended to be educationally disadvantaged by either having left school early or having performed poorly at school. They tended to have experienced higher combat exposure, and they had higher levels of mental health problems. They tended to be preoccupied by thoughts of their deployment and did not perceive their return home as welcoming. Membership of the Vietnam Veterans Association of Australia tended to be associated with high consumption of healthcare, with poorer physical and mental health. However, when these predictors were fitted simultaneously with health problems and sociodemographics, only poor education and homecoming variables remained significant.

The finding on the association between education disadvantage and healthcare consumption may have application in preventive health program development. Social support findings in relation to veterans' deployment experiences and healthcare consumption needs to be further considered and investigated by Defence and Repatriation authorities. Substantial gains in both healthcare cost savings and veterans' health and welfare may be achieved by learning from these findings. The provision of up-front

preventive programs and deployment support conditions would appear to have potential to offer cost-effective investment opportunities.

A report on these findings has been published (Marshall et al., 1998b) and the paper is reproduced at Appendix 5.2.

In the previous chapters, self-report healthcare utilisation for a two-week period prior to the interview has been used as the measure of healthcare consumption. This raises two issues.

- Firstly the possible limitations of a two week reporting period in accurately identifying actual healthcare consumption patterns and their predictors.
- Secondly the potential of biases that may be associated with self-report.

These issues are addressed in the next two chapters. Actual medical care utilisation data over a twelve month period were first extracted and used to further examine the predictor variables used in the models (Chapter 6). Then, actual medical care consumption data for the two-week self-report period were also available to be used for checking the accuracy of the self-reporting (Chapter 7).

6 CHAPTER 6: MEDICAL SERVICE UTILISATION BY VIETNAM VETERANS: PTSD AND OTHER PREDICTORS

"The Committee believes it can conservatively estimate that only half the number of veterans and families in need is currently being assisted. This is supported in submissions to the Inquiry ..."

(House of Representatives Standing Committee on Community Affairs, 1988a) p6.

6.1 CHAPTER 6 ABSTRACT

To examine the relationship between post-traumatic stress disorder (PTSD) and medical care utilisation by Vietnam veterans, data from an epidemiological study of 641 Australian Vietnam veterans were merged with medical care utilisation data on these subjects from the Department of Veterans' Affairs and the Health Insurance Commission. (The availability of the self-reported healthcare consumption data from the epidemiological study also allowed examination of the validity of the self-report measure. This is further explored in Chapter 7).

Major predictors of medical care utilisation were age ($136 per year for each 5-years) and number of diagnoses reported ($81 to $112 per year for each diagnosis). Mental health factors such as depression ($14 per year for each symptom reported) and anxiety ($27 per year for each symptom reported) were also important predictors. Results indicated that a diagnosis of PTSD was associated with major medical costs ($140 per year) even though those costs were frequently for treatment of physical conditions. The findings indicate that, however they are incurred, high healthcare, and presumably, economic and personal costs are associated with PTSD. From a purely economic perspective as well as being socially responsible, this warrants continued efforts to identify and implement effective prevention and treatment programs.

6.2 INTRODUCTION

In the previous Chapter self-reported data were used to examine healthcare consumption in relation to various health and psychosocial factors. According to the self-report data from recent epidemiological surveys of Vietnam veterans, veterans are sicker than the general population (Commonwealth Department of Veterans Affairs, 1998; O'Toole et al., 1996b). However, as reported in Chapter 4, they do not use more health services once their worse health state is controlled (Marshall et al., 1998a). The previous chapter's analyses of self-reported healthcare consumption focused on post-traumatic stress disorder (PTSD) as a particular issue amongst veterans. It was found to be a major predictor of total healthcare consumption, along with depression and other mental health problems. Other psychosocial factors were found to be associated with healthcare

consumption, including perceived social support and stressful experiences during the veterans' Vietnam deployment.

The earlier analyses of self-reported healthcare consumption raised a number of questions including the effect of the short reporting period (two weeks), which was chosen to minimise recall bias and maximise recalled detail of the health services used. However, there was some concern that the short reporting period may have given a distorted picture of service use over a longer period. For this reason, data were sought on healthcare consumption over a longer period. An approach was suggested by a limited amount of previous work in survey samples (Korten et al., 1998; McCallum et al., 1994a). These studies had drawn on records of the Department of Veterans' Affairs (DVA) and/or the Health Insurance Commission (HIC) to examine actual medical service utilisation.

The DVA and HIC agreed to provide assistance in extracting data on benefits paid for subjects in the epidemiological study of Vietnam veterans reported previously (Marshall et al., 1998b). Unfortunately the HIC data represented only medical services used by the veterans. Similarly, DVA data, although representing all services, provided by DVA to entitled veterans, did not account for all services used by these veteran subjects, as some were only partially entitled or not entitled to DVA funded services for all their healthcare. However, by combining DVA and HIC data it was possible to cover all medical services for which payments had been made, but not other healthcare services.

Figure 6.1 shows the time period during which the self-reported healthcare consumption used in the previous chapter and the medical care utilisation reported in this chapter occurred. Self-report data covered all healthcare services for a period of only two weeks prior to each subject's interview, whereas the medical benefits data were selected to

cover the one-year period six-months each side of each subject's survey interview date, with non-medical services excluded.

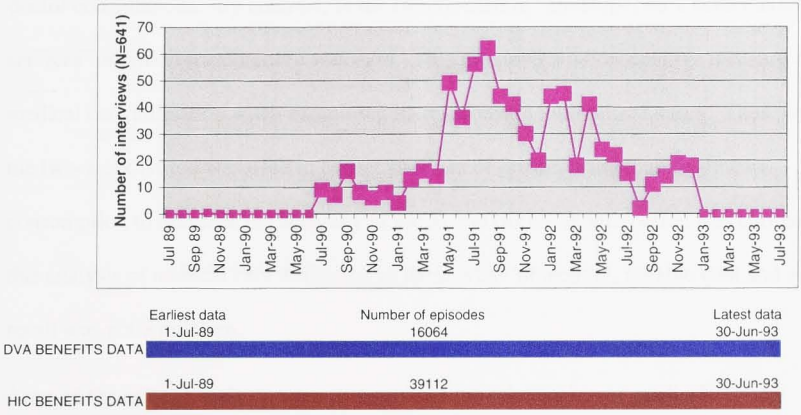

Figure 6.1 Relationship between self-report of health services and data on medical benefits paid.

There were two reasons for conducting the additional investigations described in this chapter. The first was to provide a more sensitive measure of medical care utilisation that stretches over the more common finance and budgeting period of twelve months rather than the two-week self-report period. The second was to provide a validity check on the self-report data used in earlier analyses. The second of these aims is the subject of the next chapter. This chapter examines the relationship of medical care utilisation and the selected predictor variables.

The use of medical benefits data gives a means of checking whether the relationships found in the self-report data are robust by repeating the analysis with data objectively

recorded over a longer time period on a key component of health service consumption. In the two-week self-report period, 86% of subjects self-reported some healthcare consumption even if only taking some medication. However, only 23% self-reported doctor consultations. By contrast, in the twelve-months' envelope, 80% used medical services for which some benefit was paid. This provided a more sensitive measure of medical care utilisation when examining its relationship with other factors. Thus, while the two-week period was used in earlier analyses of self-reported total healthcare consumption to optimise the accuracy of recall, the twelve-month period was chosen for this analysis of medical care utilisation as these were 'objective', reliable data and subject recall was not a problem.

Aims of the present analysis were to determine the relationship of medical service utilisation to physical and mental health measures and, in particular, to PTSD. The thesis research also aimed to ascertain whether aspects of service in Vietnam are related to increased medical care utilisation with health status and age controlled.

Accordingly, the hypotheses examined in this chapter are

- that medical care utilisation is related to level of illness (physical and mental)
- that post-traumatic stress disorder (PTSD) results in utilisation of medical care of the same order as other medical diagnoses
- that aspects of service in Vietnam are related to increased medical care utilisation with health status and age controlled.

6.3 METHOD

6.3.1 SUBJECTS

The 641Vietnam veterans from the epidemiological study outlined in Chapter 2 were the subjects for this analysis (O'Toole et al., 1996a).

6.3.2 MEASURES

The data used in the analyses for the veteran subjects came from the health and psychological state questionnaires, army personnel and psychological records, listed in Chapter 2. Importantly, for this analysis, the data from the epidemiological study were supplemented by health service consumption data from HIC and DVA. Each organisation extracted administrative data on the subjects according to an agreed protocol to protect subject's privacy during data linkage and produce a de-identified, linked dataset as the final product of the matching and extraction algorithm. Both authorities were provided with a list of subjects' names and dates of birth linked to a randomly assigned Unit Record Number. A separate file, which linked the Unit Record Number with the study subject number, was retained by the study managers and filed separately from the study survey and demographic data.

DVA and HIC extracted data for the four-year period surrounding the two years of data collection after probabilistic matching of the subjects with the agencies' Client Master Indexes. Following data extraction, all records of medical service utilisation were compiled into a file that was provided to the study investigators with subjects identified only by the randomly assigned unit record number. Once the benefits data were returned

to the study investigators, a further substitution process was undertaken which replaced the unit record number with the study subject number. DVA data variables were mapped to the HIC format and the records were combined into an aggregated data set. The data returned from DVA and HIC were separately archived and analysis continued on the combined data.

The merged data set was then examined for duplicate records to ensure there was no overlap between the benefits paid by DVA and those paid by HIC. No overlap was found. The next step was to remove benefits paid by DVA for other than medical services. The aim was to obtain uniform data for medical services only without confounding by other services paid by DVA such as hospital, allied health, and some paramedical services.

The medical care utilisation records for each subject number were aggregated to produce a sum of total medical care utilisation in the twelve months period around the interview. The totaled medical care utilisation variable was then linked to the survey and demographics variables using subject number. Approval for this process was obtained from the ANU Ethics Committee, the DVA Ethics Committee and the Ministerial Delegate of the HIC after fully specifying and explaining the privacy protection procedures.

6.3.3 PREDICTOR VARIABLES

The selected variables were examined in seven blocks of related measures. Variables were grouped into blocks on the basis of their relationship to the model described by the hypotheses. The first block examined was the age of the veteran because age is a known

predictor of health service use (McCallum et al., 1994b). The next two were for variables that measured current physical and mental health state. The next four blocks grouped variables that describe various aspects of pre-existing risk, exposure to health risks on deployment and finally the quality of the veterans' homecoming and repatriation after their deployment. These seven blocks relating to health and psychosocial factors are described in detail in Chapter 2 and Chapter 5.

6.3.4 DEPENDENT VARIABLE

DVA and HIC benefits payments were summarised by totaling benefits paid for each subject during the twelve-month period from six months before to six months after each subject's interview date. The constructed variable of twelve-months medical benefits paid for each subject was then merged through a subject number link with the independent variable file to be used for the regression analyses in this chapter.

6.3.5 REGRESSION MODELS

The same strategy as described in the previous chapter (Chapter 5) was used in the present analysis of medical care utilisation. For these analyses, missing values were again replaced by means.

6.3.5.1 Univariate models

As in the previous analysis, the hypotheses focus on the relationship of PTSD and medical care utilisation. Therefore, those blocks of variables, which have common causal pathways with PTSD (the Vietnam experience and veteran status), were not added to models until after the relationship between PTSD and medical care utilisation had been explored. Age and physical conditions, which were hypothesised to have a largely

independent association with healthcare consumption, were fitted first to the multivariate models so that the relationship between PTSD and healthcare consumption could be identified with age and physical health controlled.

The same 37 predictor variables were used as those used in examining self-reported healthcare consumption cost in the previous chapter. They are listed in Appendix 2.2 individually. The relationship of each to actual medical care utilisation was examined both individually and after controlling for age and physical health. The effect of the 37 variables in the four regression models described in Chapter 2 (page 37) was then calculated.

As in Chapter 5, the model of major interest in these analyses is Model 2, PTSD fitted with age and physical health controlled. In this way, costs associated with PTSD free of correlated physical illness could be examined.

6.3.5.2 *Multivariate examination of complete blocks*

As in Chapter 5, the relationship of the complete blocks of variables and actual medical care consumption was examined using the R^2 statistic to measure the variance accounted for by each block. In Step 1, the seven blocks of factors were each examined in a linear regression model to assess the effect of each block of variables as predictors of the subjects' medical care utilisation.

The last four blocks were then each fitted to the model with the age, physical and mental health blocks (Step 2), and variances accounted for by the alternative combinations were observed. Finally (Step 3) all blocks were fitted to the model together.

This analysis sequence identified which groups of factors were most highly related to medical care utilisation cost, and to what extent the blocks of factors were distinct from each other in their effects.

6.4 RESULTS

6.4.1 UNIVARIATE REGRESSION OF INDIVIDUAL PREDICTOR VARIABLES

Each predictor variable was tested singly and after controlling for age, physical and mental health. Table 6.1 provides the results of these analyses. Age was found to be a strong predictor of medical care utilisation. Each five-year increase in age was associated with increased medical care utilisation of $47 per annum ($p<0.001$). This effect was even greater once other variables were controlled, with each five-year age group increasing medical benefits payments by $137 per year ($p<0.001$). In the area of physical health, each physical diagnosis was associated with an increase in healthcare utilisation: $112 per year for diagnoses more prevalent in veterans ($p<0.001$) and $81 per year for diagnoses not more prevalent in veterans ($p<0.001$). This relationship persisted when other variables were controlled.

Table 6.1 Results of regression models examining 37 variables individually and fitted together as predictors of self-reported medical care utilisation in Vietnam veterans

Predictors	High Score	Univariate (Model 1) Coeff ($)	Age & Physical Health Controlled (Model 2) Coeff ($)	Age, Physical & Mental Health Controlled (Model 3) Coeff ($)	Full Model (Model 4) Coeff ($)
1. Age					
Age in 5 year intervals	Older	46.99 **	26.91 *	30.88 *	136.72 **
2. Physical Health					
Each veteran high risk diagnosis	Diagnoses	111.58 **	95.59 **	88.67 **	76.62 **
Each veteran low risk diagnosis	Diagnoses	80.92 **	65.94 **	56.15 **	53.42 **
3. Mental Health					
Level of depression (20 points)	Depressed	13.90 **	9.37 *		
Marital dysfunction (32 points)	Symptoms				
PTSD current diagnosis (0-1)	Present	140.19 *	92.32 p=0.087		
Total phobia symptoms (max 5)	Symptoms				
Lifetime alcohol symptoms (max 9)	Symptoms				
Level of anxiety (0-10)	Anxious	26.58 **	18.35 *		
4. Predisposition					
Measured intelligence level (scale 1-20)	Hi Intel				
Personality self orientation symptoms (max 7)	Symptoms				
Antisocial personality indicators (max 10)	Symptoms				
Personally reluctant to go to Vietnam (0-1)	Anti				
Significant others opposed deployment (max 3)	Anti				
Personally committed to Vietnam war (0-1)	Pro	167.79 *			
Felt ill-trained or prepared (0-1)	Problems				
Educational difficulties (0-3)	Problems				
Age at start of first deployment	Older		-23.40 *	-23.58 *	-35.93 **
Non-combat stressors during deployment (max 14)	Hi Stress	28.26 *			
5. Deployment Profile					
Deployed alone and not with a unit (0-1)	Alone				
Combat incident exposure (max 21)	Hi Combat	8.43 *			

Combat role of unit (max 13)	Hi Combat				
Disciplinary charges during service	More				
Years service experience pre-Vietnam	Longer	9.80 *			
6. Repatriation					
Pleasure in leaving Vietnam (max 2)	Positive	-124.16 *	-106.62 *	-103.78 *	-93.07 *
Amount talked about Vietnam 1st six mths (max 5)	More Talk				
Experience of discrimination over deployment (0-1)	Often				
Reluctance to reveal veteran status (max 4)	Often				
Arguments/fights over Vietnam involvement (max 2)	Often				
Often think about Vietnam (0-1)	Often	225.82 *			
Anger at others over Vietnam (max 2)	Often				
Shame over Vietnam service (0-1)	Often			-204.71 *	
Gladness of others at return (0-6)	Not Glad	56.62 *	52.95 *		
7. Exservice Organisation Membership					
Active in Returned & Services League (max 2)	Active	67.01 *			
Active in Vietnam Veterans Assoc (max 2)	Active	96.67 **	76.57 **	75.29 **	75.13 **
Active unit association member (max 3)	Active				
Closeness with other veterans (max 7)	Closer				

* p<0.05, ** p<0.01
(Only those coefficients where a significant relationship was detected are reported)

6.4.1.1 PTSD and medical care consumption costs

Of the mental health variables, the presence of PTSD was found to have a major effect on medical care utilisation, increasing it by $140 per year ($p<0.05$). Although it did not achieve significance once age and physical health were controlled (β=$92.32, $p=0.087$), the coefficient changed in a similar way to that in the previous chapter. The failure to retain statistical significance was probably due to the conservative nature of the diagnostic criteria used as the measure of PTSD in this model. When the Mississippi PTSD symptom score was substituted as the PTSD measure, a significant relationship with actual medical care utilisation cost was observed. Each point of the 35-175

Mississippi scale predicted $1.90 in medical care utilisation cost per year ($p<0.05$) after controlling for age and physical health measures.

Loss of significance of PTSD as a predictor of medical care utilisation once other mental health problems were controlled was again consistent with the high degree of covariance between these diagnoses as discussed in the previous chapter. It was also consistent with the findings of Grayson et al. (1998) indicating a similar relationship between depression, anxiety and other mental health disorders with combat as that observed for PTSD. The Mississippi score, in fact did have a moderate bivariate correlation with CES-D (0.606, $p<0.001$) and STAI anxiety (0.732, $p<0.001$).

The relationship between PTSD and actual medical care consumption is the important finding of this chapter. While not as secure as the finding in Chapter 5, the methodology is robust because of the confirmed relationship with the (more sensitive) Mississippi score and the conservative but less controversial nature of the diagnostic measure.

6.4.1.2 Other mental health predictors of medical care consumption costs

Other major mental health problems that were found here to be related to medical care utilisation were depression and anxiety symptoms. Each point in the 0-20 scale derived from the CES-D score was associated with an increased medical care utilisation of $14 per annum ($p<0.001$). Each point on the 0-10 scale derived from the STAI anxiety score was associated with an increased medical care utilisation of $27 per year ($p<0.001$). An important finding was the lack of association between a history of alcohol abuse and medical care utilisation costs. This again tended to confirm the finding for self-reported total healthcare consumption cost in the previous chapter.

6.4.1.3 *Other factors*

Of the predisposition factors, the only predeployment characteristic found to be associated with increased medical care utilisation was the veteran's propensity to be a supporter of the war effort. Those veterans who were so disposed were found to be consuming $168 per annum more medical care ($p<0.05$). However, this relationship attenuated to insignificance when age and physical health were controlled. Veterans who were older at the start of their first tour were found to consume less medical care once current age, physical and mental health and other factors in the model were controlled. This is a strong relationship, with each year of age at the start of the first tour being associated with $36 per year less medical care utilisation after all other variables of interest were controlled ($p<0.001$).

From the block of variables covering deployment profile, the combat index was found to predict a slightly higher utilisation of medical care ($8.43 per year for each point on the 21-item scale, $p<0.05$). Time in the Army prior to Vietnam also predicted higher use of medical care ($9.80 per year, $p<0.05$). However, these relationships were attenuated after current age and physical health were controlled.

Of the repatriation variables, the veteran's own attitude to coming home was related to medical care utilisation. A positive attitude reduced use of medical care by $124 per annum for each point on the 0-2 index ($p<0.05$). After controlling for other factors, this relationship remained significant with each point being associated with a $93 per year reduction in medical care utilisation ($p<0.05$). Thinking often about Vietnam was associated with an additional medical care cost of $225 per year ($p<0.001$). The veteran's feeling ashamed of his Vietnam service became associated with a significantly

lower utilisation of medical care ($205 per year, $p<0.05$) after age, physical and mental health were controlled.

As in the analysis of the self-report data, perceived lack of gladness of other people towards their return was also a predictor of increased healthcare consumption. However, in contrast to this association with total healthcare consumption, identified in the previous chapter, the relationship of this variable with medical care utilisation disappeared once age, physical and mental health were controlled.

Among the factors covering exservice organisation membership, the strongest association was found to be with membership of the Vietnam Veterans Association (VVAA). Even after all other variables were controlled, membership of the VVAA was found to be associated with additional medical care cost of $75 per year for each point on the 0-2 scale ($p<0.001$)

6.4.2 VARIANCE ANALYSIS OF BLOCKS OF FACTORS

The results of this analysis are summarised in Table 6.2. The following blocks of factors, when fitted alone (Stage 1), explained a small but significant percentage of the variance. The variance associated with each block was age: $R^2=1.8\%$ ($df=1$, $p<0.001$), physical health: $R^2=9.0\%$ ($df=2$, $p<0.001$), mental health: $R^2=3.0\%$ ($df=6$, $p<0.05$), deployment: $R^2=2.5\%$ ($df=5$, $p<0.05$), repatriation: $R^2=3.6\%$ ($df=9$, $p<0.05$) and exservice organisation membership: $R^2=4.0\%$ ($df=4$, $p<0.001$). With age, physical and mental health fitted to the model (Stage 2), the only other blocks identified as adding significantly to the R^2 for the model were repatriation ($R^2=2.6\%$, $df=9$, $p<0.05$) and exservice organisation membership ($R^2=2.4\%$, $df=4$, $p<0.05$).

With all blocks fitted sequentially to the model (Stage 3), the major contributor to the R^2 for the model of 16.3% was the physical health indicator block, basically comprising the number of diagnoses for physical illness reported (R^2 change=7.7%, df=2, p<0.001). Age added a further 1.8% (df=1, p<0.001), the repatriation block 1.4% (df=9, p<0.05) and exservice organisation membership 2.2% (df=4, p<0.05). R^2 change associated with the mental health block was attenuated in the full model. This effect is again consistent with much of the medical care utilisation associated with mental health factors being also associated with increased treatment for physical diagnoses, predisposition, deployment exposure, and repatriation measures.

Table 6.2 Examination of model by reduction of variance associated with blocks of selected factors

	Individually (Step 1)			Controlling For Age, Physical & Mental Health (Step 2)			Blocks Fitted Sequentially – Full Model (Step 3)		
	df	R^2	p	df	R^2	p	df	R^2	p
Age	1	1.77%	0.0007				1	1.77%	0.0007
Physical	2	8.96%	0.0000	{ 9	10.63%	0.0000	2	7.70%	0.0000
Mental	6	2.67%	0.0086				6	1.15%	0.2304
Predisposition	10	2.11%	0.1961	10	1.51%	0.3862	10	1.51%	0.3862
Deployment	5	2.51%	0.0063	5	0.30%	0.8361	5	0.58%	0.5551
Repatriation	9	3.64%	0.0051	9	2.60%	0.0305	9	1.44%	0.0232
Exservice	4	3.95%	0.0000	4	2.35%	0.0022	4	2.18%	0.0033
Sum of R^2		25.62%			17.37%		37	16.34%	0.0000

Using 641 interviewed subjects from random 1000.
Missing values replaced by means.

The differing R^2 totals for each of the models indicate the degree of covariance between the blocks of factors. For example the total of the R^2 values for Stage 1 indicates the total variance that the model might explain with all fitted together if all the variables were

totally independent of each other in their relationship with medical care consumed. As in the previous chapter, the R^2 for Age, Physical and Mental health blocks when fitted together (10.63%, df=9, $p<0.001$) is less than the sum of the R^2s for each block when fitted independently (1.77%+8.96%+2.67%=13.40%). Again this is consistent with some of the relationship between medical care consumption and mental health being mediated by physical presenting problems or vice versa. This overlap is again evident across the remaining blocks as indicated by the column totals. Similarly, the relationship of the age and health blocks of factors with medical care consumption may be being manifested via the predisposition, deployment, repatriation and exservice measures and vice versa.

6.5 DISCUSSION

There were three major areas of outcome for this the part of the thesis research. Firstly, predictors of medical care utilisation over a period of a year were determined using 'hard data' rather than self-report of service consumption. Secondly, the validity of self-report was measured by comparing self-report medical care consumption with actual medical care utilisation cost. This is discussed in the next chapter. Thirdly, the match extraction of the subjects' medical care utilisation data described in Appendix 6.1 replicated the success of other recent studies in demonstrating reliable retrieval of these data (Korten et al., 1998; McCallum et al., 1994a).

As hypothesized, it was found that current age and physical health (diagnosed illnesses) were strong predictors of medical care utilisation. As single variables, a number of mental health problems were also predictors of medical care utilisation.

6.5.1 MEDICAL CARE UTILISATION, PTSD AND OTHER MENTAL HEALTH FACTORS

Particularly strong relationships were found between medical care utilisation and a confirmed diagnosis of PTSD, and with depression and anxiety symptoms. These findings on PTSD are conservative, as they are linked purely to a clinically diagnosable level of PTSD. They do not therefore take into account the often seriously disabling levels of sub-clinical PTSD symptomatology often discussed in the literature. While the Mississippi PTSD scale includes the sub-clinical range of measures, the more conservative diagnostic standard was used in the regression models to avoid the alleged potential for over-diagnosed PTSD to confound the findings (Neal, 1994).

The relationship between diagnosed PTSD and medical care utilisation was attenuated and marginally lost significance after physical health measures were controlled. However, when the (more sensitive and less conservative) Mississippi measure of PTSD symptomatology was used, the strong relationship between medical care utilisation cost and PTSD symptomatology remained, even after controlling for the effects of age and physical health.

Therefore, while not so secure as the finding in Chapter 5, the effect observed in Model 2 again was consistent with a utilisation pattern where a proportion of the medical care utilisation associated with PTSD may have been related to additional physical diagnoses in those patients with PTSD. This is again consistent with theories of somatisation (Pilowsky, 1997; Stansfeld et al., 1993; van der Kolk et al., 1996) or alternative causal pathways.

The relationship between mental health factors including PTSD and medical care utilisation also overlapped with the predisposition, deployment and repatriation blocks of factors. This is not surprising, as many of these are known moderators or behavioural consequences of PTSD symptom patterns. For example, fights over Vietnam and perceived discrimination over Vietnam status may well be related to hyperarousal symptoms in PTSD patients. Similarly often thinking about Vietnam could be a manifestation of intrusion symptoms in PTSD patients.

However the relationship between PTSD and medical care consumption observed in model 1 above arises, it is nonetheless an important result of deployment experience simply because of the causal pathway required by diagnostic criterion A (American Psychiatric Association, 1994). On that basis alone, it warrants serious attention.

6.5.2 OTHER PREDICTORS

Veterans who were younger at deployment tended to be higher consumers of medical care, as were those with higher levels of combat exposure and length of time in the Army prior to deployment. The relationship with age at deployment was strengthened in the full regression model, suggesting a real propensity for those who were young at deployment to use more medical care even after other health and social factors are controlled.

Repatriation factors associated with higher medical care utilisation were self-perceived negative homecoming experience and membership of exservice organisations. However, these relationships disappeared after age and physical health effects were controlled

suggesting that, as with PTSD, it may also have been largely related to medical care costs via presenting physical symptoms.

A feeling of shame over Vietnam service was associated with reduced medical care utilisation once other health and psychosocial factors were controlled. This association is consistent with veterans avoiding visits to their medical practitioner because of a reluctance to reveal their veteran status.

The lack of relationship between alcohol abuse and healthcare consumption that was observed with the self-report consumption data was also found with this medical care utilisation data that covered a twelve-month period. This is a surprising finding, as previous research with clinical samples found that alcohol was associated with significant healthcare costs (Garnick, Hendricks, Comstock, & Horgan, 1997). The Garnick study and other recent studies found on this topic (Burke, Meek, Krych, Nisbet, & Burke, 1995; Kriegsman & Anthes, 1998) relate to costs associated with treatment of alcohol abuse or costs of treating alcohol-related trauma. The findings of this thesis research do not dispute that large costs are incurred treating people for alcohol abuse or alcohol related problems. That has been empirically demonstrated, is widely accepted and has been the basis of much policy and social reform. Nevertheless, the lack of association between a history of alcohol abuse/dependence and current medical/healthcare consumption in this community-based sample is a finding of this thesis research and a similar New Zealand analysis using a population sample (Devlin, Scuffham, & Bunt, 1997). The finding holds for both self-report of total healthcare consumption and the more 'objective' benefits-paid measure.

The match-extraction of benefits paid data in relation to a sample of subjects who were randomly selected from the community was apparently very successful. Records were found for the majority of cases. In the four-year data envelope examined, only 40 of the 641 subjects interviewed had no records retrieved of benefits payment. The most likely explanation for these subjects is that they were non-users of medical consultation services during this period. Other explanations are that they were not correctly identified in the HIC or DVA client indexes. This level of inability to locate records is consistent with levels found in earlier studies of this type (Korten et al., 1998; McCallum et al., 1994a).

6.5.3 IMPLICATIONS

PTSD as the major focus of this thesis research, was found to be associated with major medical costs even though a substantial proportion of those costs may have related to treatment for physical presenting diagnoses. Although not as secure as the finding in relation to self-reported total healthcare costs, the methodology suggesting these relationships is robust because of the conservative PTSD measure used in the model. The existence of costs associated with PTSD, even after related physical health and age factors are controlled, is confirmed using the more sensitive Mississippi scale.

When we add to such healthcare costs, the economic and personal costs that must be associated with such pathology, continued efforts to identify and implement effective prevention and treatment programs for PTSD would be well justified.

Overall, factors that were important predictors of medical care utilisation were: number of physical diagnoses, mental health conditions (particularly depression and PTSD), often thinking about Vietnam, and quality of homecoming. These were similar to the

predictors of self-reported total healthcare consumption identified in Chapter 5. However, there were differences in the psychosocial factors, which predicted consumption of medical care and total healthcare. Differences in predictors of primary medical care consumption and other healthcare consumption have similarly been found in other studies such as McCallum et al (1994b) and Korten et al (1998). The comparisons between predictors of medical care consumption and total healthcare consumption will be discussed in more detail in Chapter 8.

This chapter examined predictors of actual medical utilisation over a twelve months period. The previous chapter examined predictors of self-reported total healthcare consumption over a two-week self-report period. Before observations can be made on the difference between predictors of medical care utilisation and total healthcare consumption from these data, some examination is needed of the validity of the self-reporting. This is addressed in the next chapter.

7 CHAPTER 7: THE VALIDITY OF SELF-REPORT AS A MEASURE OF MEDICAL SERVICE UTILISATION

"O wad some Power the giftie gie us

To see oursels as ithers see us!

It wad frae monie a blunder free us

An foolish notion:"

(Robert Burns: 1759-1796)

7.1 CHAPTER 7 ABSTRACT

By combining epidemiological survey data from the Australian Vietnam Veterans Health Study (AVVHS), with data on actual medical care for which the Health Insurance Commission or the Department of Veterans' Affairs paid benefits, it was possible to directly compare self-reported medical care consumption with actual medical care utilisation. The comparison revealed that veterans' self-reports were a valid measure of relative medical care consumption because those who reported care over the past two weeks were much more likely to have been consumers than those who did not. This relationship became even stronger if the comparison of self-report was extended to data on benefits paid beyond the two-week self-report period. However, the HIC and DVA data confirmed only 51% of veterans self-reporting medical care consumption during the past two weeks as having received them.

This resulted in a substantial over-estimate of medical care consumption when compared to actual utilisation. Even though those subjects who were actually provided with two or more services in the two-week self-report period substantially under-reported their medical care consumption, a large net over-estimate of medical care consumption was produced by the self-report data. Therefore, the finding has important implications for use of self-report data from surveys such as the ABS National Health Survey for estimating health service consumption.

7.2 INTRODUCTION

The previous chapter made use of objective administrative data on medical care utilisation to provide a measure that encompasses a substantial time period of twelve months. The reporting period of twelve months provided useful reference data for the analyses in Chapter 6, as twelve months is the period generally used for financial reporting and budgeting. In contrast, the self-report data used in Chapter 5 covered the two-week period immediately prior to the interview to optimise recall precision. Nevertheless, the self-report data and the objective administrative data both contained subsets of medical care consumption measures covering the two weeks immediately before the interview. This overlap provided an opportunity to validate the self-report data used in earlier analyses.

This chapter reports on the results of the validation of self-report against the objective administrative data obtained from Department of Veterans' Affairs (DVA) and the Health Insurance Commission (HIC).

Some of the seminal articles on the accuracy of self-report include Eisenhower (1991) Groves (1989) Brown (1985) Bradburn (1987). All refer to the problem of 'telescoping' when self-report data are used. Telescoping may result in over-reporting, through subjects' recalling events that occurred before the specified period as having occurred within it. It is said to be more common with self-reports relating to the very recent past. It is also more likely when there are fewer events to report and the most recent event is reported as having occurred within the reporting period, even if it was some time before that.

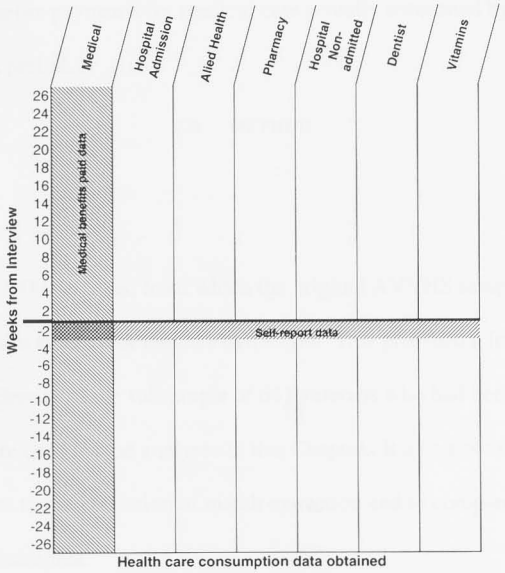

Figure 7.1 Relationship between self-report healthcare consumption data and extracted benefits paid data for medical service utilisation for each subject

Figure 7.1 shows the relationship between the two data sources used for this analysis of medical service consumption. Self-report data on 2-weeks medical care consumption

were obtained from the epidemiological study, which also covered all other healthcare service utilisation. Data on benefits paid for medical care in the same period were obtained from the twelve-month data on each subject provided by DVA and HIC. The two measures compared were thus related as overlapping subsets of otherwise incomparable parent data sets. The two-week data from each data set that related to the same period of medical care consumption were selected for use in this comparison of self-report and 'actual' utilisation as indicated by benefits paid by DVA and HIC. The hypothesis examined in this chapter is that self-reported medical care consumption during two weeks immediately before the interview will be matched by medical care utilisation as measured by benefits payments for medical care actually consumed by the subjects in the same two-week period.

7.3 METHOD

7.3.1 SUBJECTS

The full sample of 2000 veterans, from which the original AVVHS sample of 1000 veterans was drawn, was used for the data extraction. This provided a level of privacy protection for the identity of the subsample of 641 veterans who had been interviewed and whose data were used for the analyses in this Chapter. It also gave the scope to test different approaches to the validation of match extraction and to compare extraction results between subsamples.

7.3.2 PROCEDURE

Appendix 6.1 provides a description of the overall approach to obtaining and preparing the data on benefits paid from DVA and HIC.

7.3.2.1 *Data preparation – cost of medical services consumed*

The raw data on each occasion of service described in Chapter 6 were culled so that only those medical services provided within two weeks before each subject's interview date were retained. The HIC and DVA data contained a separate record for each occasion of medical care provided in the two-week reference period. Counts of occasions of medical service and total payments were calculated on each subject's 'actual' medical care utilisation. Cost of medical care actually used in the two weeks was calculated in two ways for comparison with self-report data producing three variables for initial examination:

- The **estimated cost** was derived from the count of occasions of service utilised, which was multiplied by the mean cost of an occasion of service used in preparation of the data in Chapter 5, to provide a common method for estimating cost of medical care consumption between the two analyses.
- The **benefits paid** measure was the benefits payments for each subject for the two-week period, summed to produce a total cost of medical care utilised. This total would, in fact, represent something more than 85% of the actual cost as it ignores co-payments from those veterans not eligible for DVA care and required to pay about 15% of the fee as co-payment.
- The third measure used was the **self-report** medical consumption measure. This comprised the medical component of the total self-reported healthcare utilisation cost examined in Chapters 4 and 5.

From this point, these three measures will be referred to as estimated cost, benefit paid and self-report. The total medical care estimated cost and total benefits payments were compiled with self-reported medical care consumption in the two-weeks before the interview was extracted from the data used in Chapter 5. This produced a data set containing one record per subject with data items representing 'actual' (benefits paid) utilisation costs and estimated cost of self-reported medical care consumption for the same two-week period.

7.3.2.2 Data preparation – examination of telescoping

To examine for the possibility of telescoping recalled events into the more recent time period, the self-reported medical care consumption variable was simplified into a dichotomous Y/N variable indexing whether or not any medical care consumption was self-reported in the past two weeks. The benefits paid data were also examined to produce a data item for each subject identifying the number of days between the date of the last medical service before the interview and the interview date. The percentage of subjects who had actually utilised medical services was then plotted cumulatively on a week by week basis separately for those subjects who self-reported some consumption and those who self-reported no consumption in the past fortnight.

7.4 RESULTS

7.4.1 MATCHING RESULTS OBTAINED

Appendix 6.1 gives the results of the data retrieval. The two-week period of medical care used in this analysis was extracted from a four-year data extraction on each subject covering the full period of the AVVHS study. The four years data served to ensure a high probability of some medical service utilisation by most subjects and hence validate the extraction. Details of the process are outlined in Appendix 6.1. For the four-year data envelope, 12,043 occasions of medical service were extracted from DVA records and 39,112 occasions of medical service were extracted from HIC records. These were checked for duplicates and were found to be mutually exclusive data sets. For the 641 subjects with whom the rest of this chapter is concerned, 95% were represented in these four-year data extracts. HIC had paid for at least one service for 92% of the subjects and DVA had paid for at least one service for 34.8% of the subjects.

In subsetting the data to include only services six-months each side of each subject's interview date, the number of subjects with at least one service in the resulting twelve-month period reduced to 80%. In the two-week period before the interview date, which is the period of interest for this chapter, only 14.4% of subjects were represented as medical care consumers. Nevertheless, with the high percentage of subjects for whom data were retrieved in the four-year window, it was concluded that the subject identification and data retrieval were satisfactory and as accurate as could reasonably be achieved across separately collected data items for both the DVA and HIC extractions.

7.4.2 COMPARISON OF SELF-REPORT WITH BENEFITS PAID

Table 7.1 crosstabulates the self-report medical service consumption for the two week period before the interview against the medical benefits that were identified as being paid in that period. The largest groups in the table were those where benefit payment data coincide with self-report. A group of 479 subjects self-reported no doctor consultations and, in fact, no benefit payment was found in the two weeks concerned for these subjects. The next largest group (74 subjects) contained those who reported at least one doctor consultation and benefits were identified as having been paid. Of the other two (discordant) groups, the one of least concern contained subjects who self-reported no doctor consultation but benefits were found to have been paid (17 subjects). This number is plausible, as benefits may have been paid for a medical service that did not require a visit from the subject (e.g. a pathology test).

Table 7.1 Cross-tabulation: Whether self-reported medical care consumption by whether utilisation occurred in two weeks before interview

		Whether medical care utilisation occurred		
		NO	YES	Total
Whether any self-reported medical care consumption	NO	**479**	**17**	496
	YES	**71**	**74**	145
	Total	550	91	641

The group of most concern in this analysis contains those subjects who self-reported a doctor consultation but no benefits were paid in the two weeks before the interview (71 subjects). This group constituted 49% of those who self-reported a doctor consultation. Therefore it was decided to compare the recent medical care consumption pattern of the group of subjects who self-reported a doctor visit in the past two weeks with that of those who self-reported no doctor visit. The variable used for this measure of the accuracy of self-report, was the time period which had elapsed since the most recent medical consultation for which a benefit actually was paid and the interview.

The measures for self-report medical care consumption and benefits paid over all cases (N=641) were correlated at 0.46 ($p< 0.001$). For those cases where benefits had been paid (N=91), the correlation between benefits and self-reported consumption was 0.33 ($p<0.001$). Where benefits paid for medical care utilisation **and** self-reported consumption were congruent (N=74), the correlation was 0.42 ($p<0.001$). The correlation between estimated cost of medical care utilisation and self-reported consumption cost was 0.50 (N=641, $p<0.001$).

Figure 7.2 shows the mean costs, by four medical care user categories, for each of the three measures. The four categories of user were those who used no services, those who attended once during the two weeks, those who attended twice and those who attended more than twice.

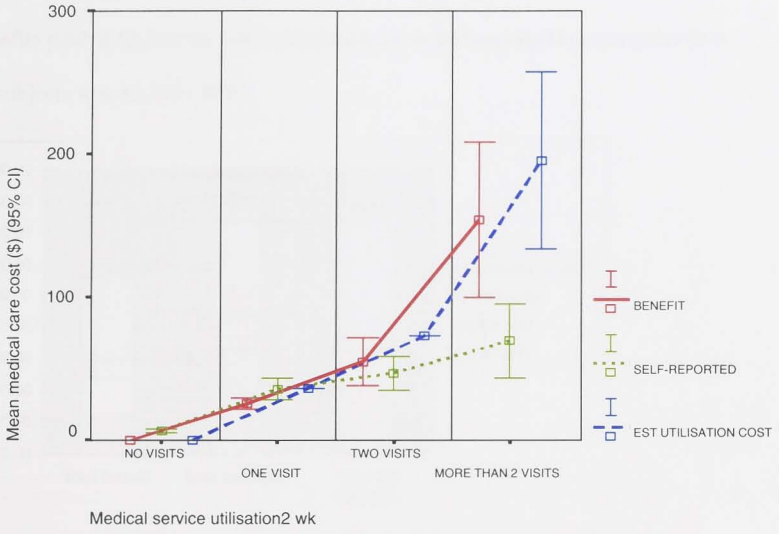

Figure 7.2 Comparison of three estimates of medical care utilisation cost: self-report, attendances multiplied by standard cost and benefit paid.

This analysis shows that there is a small but significant over-report of visits by those subjects who actually did not attend in the two weeks reporting period. This leads to a mean overestimate of costs of $6.47 per person for this group (N=550, 95% CI: $4.93, $8.01). However, because of the large number of persons involved, this group creates a very large overestimate that accounted for 46% of the $7,738 estimated as the total cost of self-reported consumption for the sample (55x$6.47/$7,738=46%). In those who attended once or twice, the three measures are similar – indicating either accurate reporting, or compensating over- and under-reporting. The opposite effect occurred in the high utilisation group where the cost estimate comparisons indicated significant net under-reporting in the self-report data with a mean under-estimate of $84.73 per case

(N=21, 95% CI: $28.53, $140.93). However, because of the smaller number of cases, this underestimate represented only 23% of the total self-reported cost-estimate. With total benefits paid of $5,619 the net overestimate from self-reported consumption data over all subjects was $2,119 (30%).

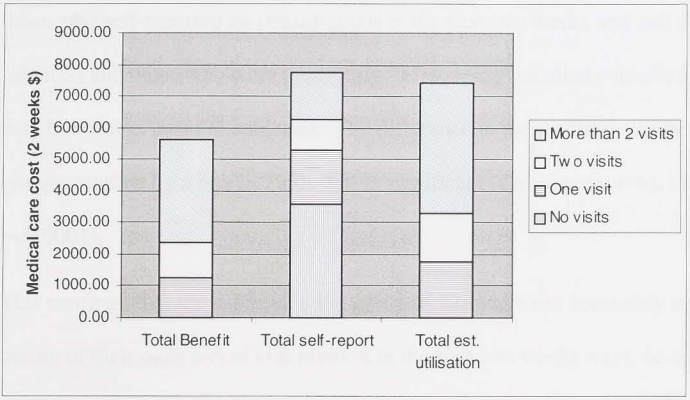

Figure 7.3 Comparison of medical care cost estimates showing contribution by utilisation category of subjects

Figure 7.3 compares the contributions of each of the utilisation groups to total medical care costs as measured by the three different methods. Clearly the consumption over-reported by those who, in fact, attended no sessions but reported an attendance (N=71) was the major component of the over-estimate of cost in the self-report measure.

7.4.3 COMPARISON OF MOST RECENT MEDICAL CARE UTILISATION BY SELF-REPORT CATEGORY

As shown in Table 7.1 (page 134), the two-week period before the interview captured positive self-report of visits to the doctor for 145 (23%) of the subjects. By comparison, benefits payments for doctor visits were found for only 91 (14%) of the subjects in this

time slice. Of the 91 subjects for whom benefits were paid, 74 (81%) had self-reported a doctor visit in the two weeks concerned.

Table 7.2 examines the four concordance categories from Table 7.1 in more detail. The first two rows of data demonstrate the difference in actual recent utilisation between those who self-reported no consultations in the past two weeks and had none (479 subjects) and those who were apparently 'telescoping' recalled consultations from more than two weeks past (71 subjects). The difference in recent utilisation between these groups, marked by a box in Table 7.2, is significant (Chi squared = 61.13, df = 4, $p<0.0001$).

This confirms that the subjects in the group of 71, while not accurately self-reporting the timing of their most recent consultation in the past two weeks were, nevertheless higher medical care consumers than those who (accurately) self-reported no medical care consumption.

Table 7.2 - Concordance of self-report medical care vs actual utilisation data for past 14 days X Number of days to most recent medical consultation

			Days to most recent medical consultation						
Self-report 2weeks medical care vs actual utilisation concordance			1 thru 14 (2 weeks)	15 thru 28 (2-4 weeks)	29 thru 56 (4-8 weeks)	57 thru 182 (8 wks-6mths)	183 thru Max (over 6 months)	never	**Total**
Self-report Consultn.	**Utilisation past 2 wks.**								
NO	**NO**	Count		31	69	168	93	118	**479**
		%		**6.50%**	**14.40%**	**35.10%**	**19.40%**	**24.60%**	100.00%
YES	**NO**	Count		24	17	13	7	10	**71**
		%		**33.80%**	**23.90%**	**18.30%**	**9.90%**	**14.10%**	100.00%
YES	YES	Count	74						74
		%	100.00%						100.00%
NO	YES	Count	17						17
		%	100.00%						100.00%
Total		Count	91	55	86	181	100	128	641
		%	14.20%	8.60%	13.40%	28.20%	15.60%	20.00%	100.00%

The difference between the groups is also illustrated by Figure 7.4. A major difference can be seen in the recency of benefits payments for subjects who self-reported a recent visit and those who self-reported no visit in the past two weeks. For those who self-reported a visit in the past two weeks, over 70% had received medical services for which benefits were paid within the past 35 days. This is in strong contrast to those who self-reported no medical service in the last fortnight. Of these, less than 15% had, in fact, received services within the past 35 days. This confirms the view that the apparent over-

reporting is largely attributable to 'telescoping' i.e. attributing some more distant albeit still recent services to the nominated reporting period.

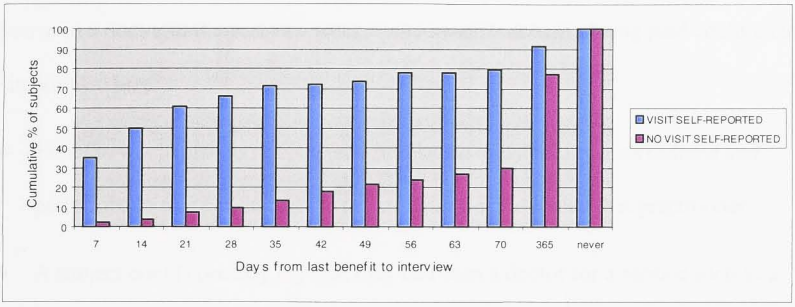

Figure 7.4. Days to last medical visit before interview

7.5 DISCUSSION

7.5.1 MEDICAL CARE UTILISATION DATA AS THE GOLD STANDARD FOR SELF-REPORT

The self-report validity check was achieved using the data collection period common to both the self-report data and the objective administrative data collections. The medical component of the self-reported healthcare consumption was cross-tabulated against the subset of medical services paid for by the HIC and DVA from the two weeks immediately before the interview (Table 7.1). If self-report of consultations and data retrieval on benefits paid are both precise, they should be very closely related, with some rare logical exceptions.

7.5.2 REASONABLE EXCEPTIONS

Legitimate causes for mismatches between a positive answer to "how many times have you seen a doctor in the past two weeks" and benefits actually being paid could include situations where:

- Benefits would also have been paid in relation to pathology tests ordered and performed in that period and the subject may not have seen that practitioner.
- A subject could correctly say that they had seen a doctor for a service such as a follow-up dressing that was part of a service which could be billed to an earlier or later benefit claim.
- A subject could have seen a practitioner, paid privately and failed to claim benefits or claimed from workers compensation, accident insurance or other alternative benefit source.

7.5.3 CAUSES OF OVER-REPORTING AND UNDER-REPORTING

The veteran's recall of the occasion of service may be 'telescoped' so that the veteran reports a service as within the past two weeks that in fact was received several weeks previously. This memory distortion is a common phenomenon (Bradburn et al., 1987; Brown et al., 1985; Eisenhower et al., 1991; Groves, 1989).

Factors involved in the apparent over-reporting may include:

- Wanting to please and so knowingly telescoping, (e.g. To be 'helpful' and provide information that is 'approximately' relevant).

- Genuinely thinking the event had happened in last fortnight (e.g. "It seems that recent").
- Interpreting 2 weeks liberally as 'recently' (this likelihood would be increased by the absence of anchor events as markers – "since some well recognisable event two weeks ago").

It is unlikely that veterans would be more prone to this over-reporting than others. In fact, as demonstrated above, the subjects in the high utilisation group were net under-reporters. This tendency to under-reporting in the high user group creates a dilemma in interpreting the meaning of the large group of 'over-reporters' who actually used no service (N=71). Clearly those who used no services cannot under-report. It is not possible to have less than zero attendance. Therefore any tendency to under-reporting in this group would not be measurable with these data. Only over-reporting instances would be observable.

Many of the interviewers, when asked for their impressions considered that the veteran subjects appeared to be answering the health status and service utilisation questions conservatively. Probing usually uncovered a higher level of health problems than volunteered. This apparent stoicism would be more likely to lead to under-reporting or minimisation of health events. It would counteract any tendency to over-reporting in comparison to non-veteran subjects.

While wanting to be 'helpful' and volunteer information would be more likely to lead to telescoping, the thesis research found predominance of under-reporting in those categories where under-reporting was possible (ie actually had two or more occasions of service). Moreover, those subjects who 'telescoped' self-reported medical care

consumption in the past fortnight were more likely to have had a recent consultation than those who reported no medical care. Thus they tended genuinely to be higher users and their recent utilisation history confirmed this.

7.5.4 CONCLUSIONS

These finding imply that the relationships, which were observed between the predictor variables and self-reported healthcare consumption in earlier chapters, are robust predictors of actual healthcare consumption. However, the coefficients describing the relationships with estimated consumption should be discounted by the likely level of over-reporting if they are to be used for planning purposes. The self-reported levels of medical service consumption could be discounted by up to 30% to give a robust lower limit to the estimated level for actual medical care consumption. This is particularly important where a large proportion of the subjects do not have any utilisation in the reporting period. Nevertheless, once telescoping is allowed for, the relationship between the predictor variables and self-reported health service consumption is supported by the observed concordance between these data.

7.5.5 IMPLICATIONS

In summary, the thesis research has provided data on the validity of self-reports for a 2-week health service consumption period, as used in the ABS National Health Survey. It was found that about 49% of subjects self-reporting a consultation the two week window appeared to be reporting services that were actually consumed further back in time. Bradburn (1987) provides a more comprehensive discussion of the 'telescoping' phenomenon observed in these findings. However, in the higher consumer groups, this

appeared to be counterbalanced by under-reporting of the number of consultations. In addition to the observed telescoping effects, minor levels of discordance due to billing practices would be expected between accurate self-reported medical care consumption and the data on benefits paid for those consultations by HIC and DVA.

As a scale measure of medical care consumed, self-report appears to be valid in that those who report more services tended to be higher consumers. However, there appears to be up to 30% over-estimating of actual services used in the two-week reference period. Therefore, in estimating the actual rate of medical care consumption from self-report of recent use, a sensitivity discount factor of up to 30% needs to be applied to set a lower limit on the estimate. The parallel findings in Chapters 5 and 6 on predictors of healthcare consumption also confirm the validity of the scale generated by self-report when judged against the medical care benefits paid despite the different periods of utilisation examined (2weeks and 1 year).

Having tested the validity of self-report in this chapter, the difference between predictors of total healthcare consumption costs estimated from self-report (examined in Chapter 5) and the predictors of actual medical care utilisation costs can be considered with less concern about serious self-report bias. The comparison between the predictors of the total healthcare consumption costs and medical care utilisation costs is discussed in the next chapter, which also pulls together the conclusions and questions, raised by the thesis research.

8 CHAPTER 8: CONCLUSIONS – PTSD AND OTHER HEALTHCARE CONSUMPTION PREDICTORS

"Children and adults who have been traumatised, who are operating under conditions of hardship and duress, seeking support and healing are most in need of the benefits of social capital, but are least able to contribute to it. They are necessarily inward looking and survival focussed during these times." (Bullen & Onyx, 1999)

8.1 CHAPTER 8 ABSTRACT

This project used two different measures of healthcare consumption to examine the relationship of PTSD and other predictors with the amount of healthcare consumed. The two measures identified very similar predictors from among the 74 variables examined. The major finding of the study was that presence of PTSD was found to be associated with substantial levels of self-reported total healthcare consumption.

A similar association was found between PTSD and actual medical care consumed as identified by the benefits paid by the Department of Veterans Affairs and the Health Insurance Commission. This association remained when age and physical health consumption factors were controlled. Other variables which were predictors of both measures of healthcare consumption were physical diagnoses, having personally supported Australia's Vietnam commitment, personal non-combat stressors during deployment, combat exposure, frequently thinking about Vietnam, quality of welcome home and being a member of the Vietnam Veterans Association. Variables which predicted medical service consumption but not self-reported total healthcare consumption were current age, age at first deployment (with other factors controlled), years of service before deployment, lack of pleasure returning from Vietnam, absence of shame over Vietnam and being active in the Returned and Services League. Variables, which predicted self-reported total healthcare consumption but not medical service consumption were marital dysfunction, phobic symptoms, a history of educational difficulties, experiencing discrimination, arguments or anger at others over Vietnam. Possible reasons for the difference included differences in self-report and actual consumption or a differential effect of some variables over medical care and other areas of healthcare consumption. An important observation from the thesis research was that self-report, although it was a valid measure of relative healthcare consumption, substantially overestimated the actual amount of healthcare used. The project provided valuable information about the use of indicators of the impact of mental illness on healthcare consumption.

While it arose from an interest in measuring the effectiveness of interventions, it became apparent that this could only be done by first clarifying the prior major issue that is the subject of this thesis. The effort was therefore focused on establishing a baseline for how disabling and how costly the conditions and their related factors were. This then gives a basis from which to examine some of the many other factors that may be taken into account when assessing the impact of mental health problems and the effectiveness of preventive or treatment interventions. This also presented an opportunity to consider the relationship between mental health trends in a population group and potential indicators of social capital. It appears that self-reported social support may predict both social capital levels and mental health trends for the population group.

8.2 INTRODUCTION

In this thesis research, healthcare costs were measured in two ways. Firstly, self-report data were available from the Vietnam Veterans Health Study (VVHS) epidemiological survey, which included the Australian Bureau of Statistics Health Survey questionnaire. This covered the full range of health services used including medical care utilisation over a two-week recall period. Secondly, administrative data were extracted by the Department of Veterans' Affairs (DVA) and the Health Insurance Commission (HIC) on the subjects to provide twelve months record of medical care utilisation for each subject.

While the medical care utilisation data from the DVA and HIC provided 'hard' data on actual medical care utilisation for a robust period of twelve months, it does not give the full picture of health care consumption. Many services may be substituted for medical

care or used in preference for various conditions. Therefore, the self-report data were preferred as the indicator of healthcare consumption in examining the thesis research hypotheses even though they covered only a two-week period to minimise recall bias due to forgetting.

The work done to extract the medical care utilisation data had two purposes. Firstly, it provided a test of the validity of self-report as described in the previous chapter (Chapter 7). Secondly it tested the findings of the self-report data with a subset of medical data covering a twelve months period to ensure that the two-weeks data were representative of a consistent pattern of healthcare utilisation. The findings on the research hypotheses using the self-report healthcare consumption data are compared with those using the twelve months medical utilisation data later in this chapter. Firstly, however, the main findings of the research in relation to the key questions are discussed.

8.3 THE COST OF PTSD

Perhaps the most important finding of the thesis research is the high cost to the community associated with post-traumatic stress disorder in Vietnam veterans. A proportion of these costs appears to be associated with presenting physical health problems, which is consistent with existing theories of somatisation (Pilowsky, 1997; van der Kolk et al., 1996). Nevertheless, there is overwhelming evidence that there are substantial costs associated with PTSD over and above those that may be mediated by presenting physical health problems. This is the major conclusion of the present investigation.

Other costs associated with PTSD appear to overlap with costs associated with other mental health conditions such as depression. Predisposition, deployment conditions and

social variables such as social support, a sense of discrimination and frequently thinking about the Vietnam experience also appear to be associated with some of the costs associated with PTSD. When one seeks to examine the dynamics underlying these relationships, a range of possibilities are presented by the findings of models 3 and 4 in the tables in Chapters 5 & 6. However, the way the costs associated with PTSD are manifested is not the primary issue of this thesis research. The main issue raised by the findings is that costs associated with PTSD following defence deployments are substantial and this warrants commensurate efforts by health services to prevent and manage this disorder.

It also needs to be emphasised that the costs identified by the thesis research were purely related to healthcare costs. It has been widely recognised that where significant healthcare costs exist, even larger economic and social costs are typically found (Clark et al., 1994; Kamolratanakul et al., 1999; Levins & Lopez, 1999; Olsen & Richardson, 1999; Solomon & Davidson, 1997). Clinical work with Vietnam veterans and their families regularly reveals a history of family tensions, alcohol abuse and under- or over-achievement in employment. The consequence of such dysfunctional history is usually appalling personal cost and a long history of emotional suffering in those severely affected by PTSD and other service-related disorders.

To avoid the trap of overgeneralisation, it should be acknowledged that many veterans of Vietnam service were not affected in this way. Many have gone on to live rewarding and happy lives, continuing to make important contributions to their communities. Many, in fact, regard their service as a time when their skills were broadened, and their capacity to cope with hardship was developed (Royal Commission on the Use and Effects of

Chemical Agents on Australian Personnel in Vietnam, 1985). Nevertheless, it remains indisputable that PTSD and other deployment-related problems have had a profound, destructive and costly effect on the lives of up to 40% of veterans and their families.

Even though the full economic costs of PTSD are yet to be determined, this thesis research has contributed by identifying healthcare costs of between $60 and $120 per fortnight in those with a current diagnosis of this disorder.

8.4 ESTIMATING FULL HEALTHCARE COSTS OF PTSD

The healthcare costs of PTSD do not solely relate to directly-identified mental health problems. The results of the regression model analysis have indicated that some 25% (between $15 and $30 per fortnight) of the healthcare cost associated with a current diagnosis of PTSD may be attributable to higher rates of physical diagnoses found in those with PTSD. This is consistent with findings of Burges-Watson et al (1993a), McFarlane, et al (1994) and others (eg (Chibnall & Duckro, 1994; Irwin et al., 1996; Lipton & Schaffer, 1988)) that higher prevalence of a number of physical disorders is found in those who suffer from stress-related disorders.

PTSD is a condition defined by symptoms of high withdrawal and avoidance from anything associated with the traumatic experience. This includes talking about the PTSD symptoms themselves. The relationship between PTSD and higher healthcare consumption is not what would be expected after clinical practice observations. It is often extremely difficult to persuade those with high avoidance and withdrawal symptoms to continue in a therapeutic program for PTSD treatment. However, it is relatively easier to obtain agreement to seek physical health examination and care. These data, however, do not support a simple symptom substitution hypothesis.

Table 8.1 is based on the self-reported diagnosis data from Chapter 5. It shows the association between physical and mental health diagnoses and avoidance symptoms. While it is positive in both cases, the association is five times greater with mental health diagnoses than with physical diagnoses. This is contrary to the expected direction if patients were substituting physical comorbidities to avoid seeking mental health treatment. However, it again supports the observation of greater physical co-morbidity associated with mental health problems.

Table 8.1 Regression analysis of Physical and Mental Health Diagnoses against Subjects' Avoidance Scores from the PTSD Clinical Interview

	Univariate Coefficient	Full Model Coefficient
Physical diagnoses with recent actions	0.44**	0.27**
Mental diagnoses with recent actions	1.59**	1.43**

Dependent variable: Total avoidance symptoms from SCID interview
**p<0.001

8.5 HOMECOMING FACTORS: SOCIAL SUPPORT

This thesis research also provides support for the recently developed concept of social capital and its significance in mental health and community health promotion. Those veterans who considered that their service was not valued, or that they were not welcomed and supported on their return, were also among the highest consumers of healthcare. This is consistent with the proposition of social capital theorists that healthy communities are those where trust, appreciation, mutual respect and valuing are high (Cox, 1997; Fukuyama, 1995). Homecoming arrangements for those who have undertaken stressful and demanding and high-risk work on behalf of their communities

are important. This is amply supported in the results of this thesis research, which show that poor homecoming circumstances are associated with a costly and continuing burden to the community in both healthcare and social capital terms.

In this thesis research, the only costs investigated were those relating to healthcare consumption. Nevertheless, as mentioned above, there can be no doubt that the healthcare consumption costs are multiplied across family and community relationships, emotional suffering, and economic effectiveness areas.

8.6 HEALTHCARE CONSUMPTION AND ALCOHOL ABUSE

When the results of the analysis of healthcare consumption and alcohol were initially submitted for publication (Marshall et al., 1998b), one reviewer commented: "One should be quite cautious in any claim that alcohol dependence is unrelated to healthcare costs given the large literature that this is not true over sufficient time periods". This comment was provided in relation to the findings on self-reported healthcare consumption over the two-week period immediately before the interview. However, the finding was replicated in relation to the 'hard' data on the twelve months of medical care consumption.

The apparently contradictory findings, therefore, provide an interesting case study in interpretation of results arising from studies using different subject recruitment or sampling methods. The relationship between alcohol abuse and high healthcare costs referred by the reviewers above appears consistently in studies which recruit subjects from clinical settings, that is subjects undergoing treatment for identified conditions. In these circumstances, the care provided can be complicated, extended, or compromised by comorbid alcohol abuse (Ashton & Casswell, 1984; Garnick et al., 1997; Kriegsman & Anthes, 1998; Pirzada, Ries, & LoGerfo, 1997).

A consistent comment from clinical practice with PTSD sufferers also recognises the greater difficulty of coming to grips with the PTSD symptom reduction where alcohol abuse is often used by sufferers to ameliorate intrusive memories, insomnia, irritability, anxiety, and other stress symptoms. Indeed, under these circumstances, alcohol can be easily conceptualised as self-medication (McFarlane, 1998; Vaillant, 1993; Wu, Kouzis, & Leaf, 1999). Nevertheless, in this community sample, even though it was not consistent with earlier research in clinical populations, the observed effect of alcohol abuse, after controlling for other health and psychosocial factors, was to reduce healthcare consumption. This is not to deny the damaging effects of alcohol consumption.

Alcohol as self-medication and its effects in managing stress and mental illness effects in the community may also be of interest in terms of its social facilitation effects. These may included lowering inhibitions and its use as social currency to increase interaction and openness between people. It would be of interest to examine the possible positive contribution of alcohol-related activities to social capital building at the community level, while also recognising the potential negative effects of alcohol addiction and damage to health in a neurological and physical sense.

The relationship between educational disadvantage and high healthcare consumption may also operate via people using healthcare services as a substitute for other social support. Educational disadvantage may also be connected to use of medical care as a substitute for community level health information sources. This finding, while not strong in self-report data, was quite significant in the medical-care consumption data. The relationship was also apparent after controlling for general health status and psychosocial factors.

Finally, sending very young men off to war clearly carries long term risks. The finding that youthfulness at deployment predicted high healthcare consumption many years after return needs to be further investigated. This finding is independent of any vulnerability in younger soldiers to mental health and physical health damage from the war deployment even though these relationships may also hold (Lee, Vaillant, Torrey, & Elder, 1995; Rosenheck & Fontana, 1994; Sutker, Davis, Uddo, & Ditta, 1995). The finding relates to consumption of medical services after health status and other psychosocial factors are controlled. It may relate to such factors as:

- a poverty of self-sufficiency in healthcare or available support from other sources or
- lack of trust in alternative sources of healthcare or
- lower threshold for seeking care outside of immediate family and community.

These concepts could again be conceptualised in terms of depleted or underdeveloped social capital in this cohort.

8.7 SELF-REPORT AND ACTUAL MEDICAL CARE CONSUMPTION MEASURES

The thesis research findings again demonstrated the importance of allowing for memory and recall effects in use of self-reported data (Bradburn et al., 1987; Brown et al., 1985; Eisenhower et al., 1991; Groves, 1989). The good news was that the relationships between the predictors examined and self-reported healthcare consumption were quite similar to those between the same modeled factors and actual medical care consumed over the longer twelve months period. That is:

- Length of time of the self-report data collection restricted to only two weeks to minimise recall bias from forgetting did not produce substantially different results than the data on medical care consumption over one year.
- Self-report was validated against hard data where available.

Although the investigation of the validity of self-report healthcare consumption was not the primary purpose of this thesis research, it was extremely valuable. Self-report is a methodology of choice in many key health surveys, including the Australian Bureau of Statistics National Health Survey. This opportunity to test its validity as an estimate of actual healthcare consumption was important not only to this thesis research but as an indicator for other applications. The ABS NHS is the basis for much policy analysis research in Australia (Knuiman et al., 1996; Stuart et al., 1998) so any opportunity to check the validity of measures it produces is useful. These findings, therefore, should be useful to those using the ABS NHS for policy analysis, in planning and as a basis for estimating healthcare consumption. Nevertheless, the close similarity between predictors of actual medical care consumption and self-reported medical care consumption was encouraging.

A further value in the self-report data was the ability to access indicators of health service consumption other than medical care. Consolidated data on actual consumption of these services are not available in Australia for community users because of the disparate methods that an individual can use to obtain health services other than medical. Some of the differences, therefore, between predictors of total healthcare consumption and medical care consumption are likely to be related to genuine differences in patterns between medical and other healthcare services. These differences between medical care

consumption predictors and total self-report healthcare consumption predictors are discussed in the next section.

8.8 COMPARING PREDICTORS OF SELF-REPORT AND ACTUAL CONSUMPTION

Differences were found in the regression analyses for predictors of total healthcare consumption and predictors of medical care consumption. However, the overall relationship between health status and psychosocial variables was similar for both measures of service consumption as shown in Table 8.2, which compares results from Chapters 5 and 6.

Table 8.2 Comparison of predictors of self-report healthcare consumption with predictors of actual medical care utilisation

	Self-report healthcare consumption		Medical care utilisation	
	Univariate (Model 1) Coeff‡	All fitted (Model 4) Coeff‡	Univariate (Model 1) Coeff†	All fitted (Model 4) Coeff†
1. Age				
Age in 5 year intervals			**47****	**137****
2. Physical Health				
Each veteran high risk diagnosis	**40****	**25***	**112****	**77****
Each veteran low risk diagnosis	**34****	**24***	**81****	**53****
3. Mental Health				
Level of depression (20 points)	**13****	**21***	**14****	
Marital dysfunction (32 points)	**4***			
PTSD current diagnosis (0-1)	**102****		**140****	
Total phobia symptoms (max 5)	**11***			
Lifetime alcohol symptoms (max 9)				
Level of anxiety (0-10)	**18****		**27****	
4. Predisposition				
Measured intelligence level (scale 1-20)				
Personality self orientation symptoms (max 7)				
Antisocial personality indicators (max 10)				

Personally reluctant to go to Vietnam (0-1)				
Significant others opposed deployment (max 3)				
Personally committed to Vietnam war (0-1)	73*		168*	
Felt ill-trained or prepared (0-1)				
Educational difficulties (0-3)	52**	54*		
Age at start of first deployment				-36*
Non-combat stressors during deployment (max 14)	14*		28*	
5. Deployment Profile				
Deployed alone and not with a unit (0-1)				
Combat incident exposure (max 21)	5*		8*	
Combat role of unit (max 13)				
Disciplinary charges during service				
Years service experience pre-Vietnam			10*	
6. Repatriation				
Pleasure in leaving Vietnam (max 2)			-124*	-93*
Amount talked about Vietnam 1st six mths (max 5)				
Experience of discrimination over deployment (0-1)	62*			
Reluctance to reveal veteran status (max 4)				
Arguments/fights over Vietnam involvement (max 2)	39*			
Often think about Vietnam (0-1)	133**		226*	
Anger at others over Vietnam (max 2)	32*			
Shame over Vietnam service (0-1)			-205*	
Others not glad at return (0-6)	29*	27*	57*	53*
7. Exservice Organisation Membership				
Active in Returned & Services League (max 2)			67*	
Active in Vietnam Veterans Association (max 2)	21**		97**	75**
Active unit association member (max 3)				
Closeness with other veterans (max 7)				

* p<0.05 **p<0.001
‡ can be interpreted as $ per fortnight † can be interpreted as $ per year
~ high score represents NOT glad or welcoming.
(Only those coefficients where a significant relationship was detected are reported)

Some of the factors that related differently to total healthcare consumption and medical care consumption were:

- age at deployment, which predicted medical care consumption, but not total healthcare consumption, and only after current age and current health status were controlled.
- marital dysfunction, total phobia symptoms and history of educational difficulties predicted self-report healthcare consumption but not medical care utilisation.
- being younger when deployed in Vietnam and years of service prior to deployment were related to higher medical care consumption but not total healthcare consumption.
- a positive attitude in the veteran to leaving Vietnam was associated with a reduced use of medical services. This finding, together with a strong relationship between the veterans' feeling ashamed of their Vietnam service predicting lower medical use, is consistent with a scenario in which those veterans who want to put Vietnam behind them have lower medical care consumption but not necessarily lower total healthcare consumption. This discrepancy would be consistent with veterans having such an orientation avoiding conventional medical care options in favour of alternative healthcare arrangements.
- a sense in the veterans of having been discriminated against, having been in arguments and being angry over Vietnam all predict higher healthcare consumption but not medical utilisation. This discrepancy again indicates an apparent preference

in angry, resentful veterans for alternative healthcare arrangements over medical care utilisation.

- membership of the Vietnam Veterans Association of Australia (VVAA) was more strongly related to medical care utilisation than to self-reported total healthcare consumption. This is consistent with veterans who are members of the VVAA being more likely to consult with a medical practitioner, all other factors being equal. Alternatively it is consistent with veterans who are high medical care consumers being more likely to become VVAA members.
- educational disadvantage was not associated with medical care consumption but it was a strong predictor of total healthcare consumption.
- time in the Army prior to Vietnam was associated with higher medical care but not with total healthcare use. This is consistent with a development of a positive orientation to medical services while in the army.
- veterans' own positive attitude to homecoming predicted lower medical care consumption, while veterans' perception of others' attitudes to their homecoming as being less positive predicted higher consumption of both medical and total healthcare.

8.9 FURTHER QUESTIONS RAISED

Like most investigations of an area where complex relationships and alternative explanations of observed effects are found, many questions have arisen from the project. Consideration of some of the other questions would give pointers to the best ways to prevent or address problems such as the relationship between unsatisfactory homecoming experience and extra healthcare consumption. This raises questions both on how this

relationship was established and what improvements to homecoming quality would repay the community effort.

What follows, therefore, is a suggestion for further study either following on from this investigation or using other data and methods.

8.10 THE REAL COST OF PTSD

Perhaps the easiest component of PTSD cost to identify is the healthcare cost. Even with this, as mentioned above, the task is made difficult by the various overlapping costs associated with PTSD. There are the health-direct costs for care consumption for treatment of the PTSD itself. There are also costs for related disorders that either are predicted by PTSD or that generate a greater level of healthcare consumption in PTSD sufferers.

A further area where empirical estimates can be systematically made covers the cost of adverse employment effects such as lost time from work, underachievement, lost earning opportunities and lost work value. These effects could be calculated or estimated on the basis of work history compared with peers without PTSD.

However, in the more complex areas of family distress, abuse, and dysfunction the costs are far more difficult to estimate. In the area of relationship and emotional distress, estimation of costs becomes even more subjective (Carr, 1999; Coon & Edgerly, 1999; Olsen & Richardson, 1999). When it comes to the area of measuring belief dimensions such as the sense of personal and community identity, trust, and social participation even greater levels of challenge are involved (Bullen & Onyx, 1999). Nevertheless, some steps have been taken in this area and commentators such as Leeder (1998) suggest some

approaches to estimating the strength of social capital. Further credibility is given to the potential for this by the findings in this thesis research on the relationships between homecoming and social support for veterans and their ongoing healthcare consumption. Some dimensions of the detrimental effects of PTSD suggested by clinical practice are formulated in the RECOVER model (Marshall & Dobson, 1996). This model proposes that recovery from the effect of the traumatic experience and the resulting disorder needs to be resolved in several areas:

- Relationships
- Emotional orientation and responsiveness
- Cognitive rationalisation
- Old and new value systems
- Verification of self worth
- Establishing meaning of traumatic and other life events
- Re-establishing self-management and social skills – (including trust).

Instruments are available to measure social functioning and trust, the strength of self-image, the strength of relationships, as well as the more symptomatic measures of emotional and cognitive dysfunction.

8.11 RESPONDING TO THE MESSAGES

This thesis research signaled the need for a number of improvements in the way both PTSD and homecomings are handled. Programs and interventions aimed at raising veterans' sense of welcome on their return, their sense of being appreciated, and their sense of community interest in their wellbeing individually and as a group are clearly suggested by these findings.

A warning note needs to be sounded here about superficial and empty processes that may be interpreted by veterans and others in the community as additional impositions rather than appropriate, useful and desirable recognition and appreciation. Polarised, exaggerated and oversimplified praise and message giving is perhaps the most risky of the alternatives for recognition and ceremony even if meant well. One veteran recalled, "I remember the customs blokes saying to each one of us, 'Welcome home' but that was about it". Another expressed the view that even though he felt a strong need for recognition and appreciation, he deliberately avoided any acknowledgement of his Vietnam service for many years because of this polarisation. "They either wanted to fight me or f... me". So where there is ambivalence, it needs to be acknowledged together with appreciating the significance to the community's wellbeing of the veterans' efforts. There are plenty of examples of how this can be done in the context of 'winning and losing' sporting participants.

Perhaps the most important contribution is to provide for evaluation of the interventions that are introduced. An important example of the need for evaluation currently applies to the widespread introduction of debriefing processes. These are pursued apparently to fulfill multiple functions including preliminary PTSD risk assessment, information gathering, immediate stress level reduction, planning family/community reintegration, relationship re-establishment preparation, transition education, career review, grief process guidance, and employer-employee reconciliation. They also assume the function of addressing just about anything else that surfaces at the time of the crisis of deployment and/or traumatic stress. A greater clarity on intervention goals and the evaluation of goal achievement appears urgently needed (Raphael, Meldrum & McFarlane, 1995).

An alternative view of debriefing is that it is an entry point to community participation or a process to build the level of trust and understanding for community living. From a practical viewpoint it could be presented as training for the transition from the ultracompetitive team-oriented environment of combat. A similar transition could be required for civilian teams intervening in abusive violence intervention or disaster. In such an environment, no trust external to the immediate group is feasible or encouraged and even openness about shortcomings or weaknesses may have been counterproductive. Debriefing would thus have the goal of preparation or training for entry to an environment where greater openness and trust is functional and necessary for satisfying relationships and achievement.

Whatever the purpose of these activities, they should be explicit and evaluated on the basis of that purpose.

8.12 REVIEW OF ALCOHOL ABUSE FINDINGS

In the light of the unexpected findings on alcohol abuse and its relationship to healthcare consumption, further investigation would appear desirable on the causal relationships between alcohol use, alcohol dependence, community participation and other indicators of social capital and healthcare consumption. While the sample used for the current thesis research would provide many opportunities to extend this investigation further, it would also be desirable to examine these relationships in a community-wide sample containing not only veterans but representative of other community groups as well.

The traditional use of alcohol in social settings, which has been particularly prevalent in the defence forces, may cause the veteran subject group to have atypical alcohol consumption patterns. The analysis reported in Chapter 3 found a slightly higher alcohol

consumption rate in veterans than the age/sex adjusted general population before adjusting for other demographics and health-state.

A further aspect of alcohol consumption relates to its possible positive effects on social capital. Alcohol-related activities may contribute to trust building, disinhibition, greater openness, relationship intimacy, rewarding community participation (fun times together), community fundraising, etc. These need to be considered together with the negative effects, such as the association of alcohol with abusive behaviour, domestic violence, employment delinquency, and neurological mental and physical health problems.

8.13 IMPLICATIONS FOR HEALTH-SERVICE POLICY ANALYSIS

The findings from this thesis research of 'over-reporting' of medical care consumption by veterans suggest an urgent need to replicate this analysis in a non-veteran sample. I have put over-reporting in inverted commas because it overstates the nature of the issue. Nevertheless, the widespread use of the ABS National Health Survey for estimating healthcare consumption patterns in communities and healthcare utilisation settings makes this an important issue for planning of national health services. Current moves to make even further use of self-report by extending the introduction and application of Computer Assisted Telephone Interview (CATI) survey techniques for health status and service utilisation measurement makes this even more topical (Anie, Jones, Hilton, & Anderson, 1996; Capitman, Abrahams, & Ritter, 1997; Ketola & Klockars, 1999).

Subject matching techniques and extraction of health service consumption data to deidentified data sets presents an ideal opportunity to examine the validity of current instruments and survey tools.

Another finding of the thesis research might be considered in relation to the policy of patient co-payments for medical services and pharmacy services. To the extent that co-payment is put in place as a disincentive for patients to overuse healthcare services, the underlying assumption that absence of the co-payment will increase healthcare consumption is not supported by the findings of this thesis research (Chapter 4). Another aspect of co-payment policy is that it may be a disincentive for providers to overservicing. Observing these dynamics would be more complex and it is difficult to predict how it might be reflected in these findings. Nevertheless, the lack of detectable differences in veterans and non-veterans in healthcare consumption once their worse health state is controlled must raise serious doubts about the effectiveness of the co-payment in moderating healthcare provider and consumer behaviour given that veterans do have a lower requirement to make co-payments.

8.14 SOCIAL CAPITAL AND MENTAL HEALTH PROMOTION

The concept of social capital as a community resource related to community health and functioning has recently been developed in a number of forums (Coleman, 1990; Cox, 1997; Kawachi, Kennedy, Lochner, & Prothow-Stith, 1997; Smith, 1998). It is usually asserted: *"Measurement of social capital at the ecological level captures something distinct, over and above measurement of individual social connections"*. However, where attempts have been made to measure it they have used concepts such as civic engagement (membership of groups), per capita number of community organisations and trust in others. All of these require data gathering that counts individuals, groups or attributes of individuals (Kawachi et al., 1997).

Engagement in combat has four logical but contradictory connections with social capital amongst the participants:

- Membership of a defence force unit comes with a rich network of high level identification, mutual trust, role confidence and support. This must represent a high level of social capital *within* the defence force unit/environment and afterwards with other veterans who identify themselves as such.
- This would logically be combined with a high level of mistrust of others who are not members or veterans.
- A need to rebuild trust, participation and confidence in community organisations on return from deployment and on leaving the defence force. This would require a reliance on the level of social capital present in the community to enable integration to happen. After Vietnam it could be argued that polarisation and ambivalence in the community would have made Vietnam related topics a high-risk interaction for anyone in the community but particularly for the veterans themselves.
- PTSD brings with it symptoms of avoidance, hyperirritability, withdrawal and numbing. All these are contrary to the development of community engagement and trust in others.

8.15 IN CONCLUSION

Consumption of healthcare services has multiple uses as a measure. Firstly, it is one of a series of indicators of the health of different population groups. Secondly, it might also be seen as an indicator of:

- how easy it is to access healthcare,

- how effectively healthcare is marketed, valued and priced in competition with other costly options for spending time and money,
- how confident people are to ask for help for their health problems or
- how confident they are that healthcare service might actually be helpful.

In this thesis research the primary focus was on the relationship of healthcare consumption and the mental health of the subjects in the sample centering on the relationship between PTSD and healthcare consumption. In order to study this relationship, many other factors that might have influenced healthcare consumption had to be examined and techniques for separating the contributions of the various factors were explored. This also gave the opportunity to further examine the effects of deployments on defence service personnel and to partially redress the period of neglect of Australian Vietnam veterans in the research literature.

The Australian Vietnam Veterans Health Study had produced some sixteen published papers in the research literature to which this thesis research has directly contributed four (Marshall, 1997; Marshall et al., 1997; Marshall et al., 1998a; Marshall et al., 1998b; Marshall, Jorm, Grayson, & O'Toole, Submitted). There are also several other reports either distributed to interested parties or in preparation for publication. On this basis, the thesis research has made an important contribution to its topic area and the understanding of the issues of the effects of war service in general. It has also provided insights into the Australian community's orientation to its defence personnel and Vietnam veterans in particular.

As a former clinician serving with the Vietnam Veterans' Counselling Service, I found it particularly rewarding to have the opportunity to interview in detail a number of veterans and their families from the community. This enabled me to discuss the Vietnam experience with those whom one would not meet in the course of clinical practice. This has provided a much more balanced view of the health and wellbeing of veterans in general than can be gained from working only with those who are seeking help for current problems. What was particularly impressive was the continued sense of community and identity of veterans towards each other. There was also a strong response to being recognised as veterans who deserved attention and appreciation by the community, which had, through its political and defence institutions, called them to service. This project provided some attention briefly to those who participated. The co-operation and good nature of veterans and their families was also most appreciated by the study team and particularly by the interviewers who were once again prevailing on their time.

From the point of view of a health service manager, the project gave an invaluable opportunity to experience first hand the obstacle course that extracting healthcare consumption data from administrative systems involves. It also provided a reassuring insight into the protections for individual privacy that are conscientiously maintained by data managers responsible for custody of healthcare data.

The thesis research was conducted at a time when integrated care and co-ordinated care trials were promising a new, more helpful facility of clinical information exchange. It was therefore a useful basis from which to participate in many forums on ways to use information for better management of healthcare services for the benefit of the

community and individual patients. The statistical methods used in this thesis research are increasingly being adopted and adapted for development of health service analysis and resourcing formulae. A number of very useful contributions on the strengths and limitations of the various modeling methods were able to be made in eight or nine conferences and seminars attended in the course of this thesis research. Some of the presentations made in this period, which drew on work from this thesis research, are listed in Appendix 8.1.

The developing concept of social capital and the theory building around this concept has also been of assistance in providing a viable context for some of the phenomena examined in the thesis research. Many of these, particularly the issues of community support, trust, identification and participation may well be a way forward in further investigations and formulating actions.

Opportunities for further analysis have arisen from this thesis research aimed at identifying better ways for assisting sufferers from PTSD and better understanding some of the factors influencing healthcare consumption generally. These understandings, in turn, open opportunities to engage in priority setting, preventive and ameliorative activities at the community level. These activities need the best information available both to recognise the prevalence and severity of health problems and to make health services, which are provided, more effective and focused.

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APPENDIX 1 - AUSTRALIAN VIETNAM VETERANS HEALTH STUDY ACKNOWLEDGEMENTS

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Papers presenting early results of this work were delivered to the 49th Session of the International Statistical Institute, Florence, September 1993 and to the 13th International Epidemiological Association Conference, Sydney, September 1993.

APPENDIX 2.1 - AUSTRALIAN VIETNAM VETERANS HEALTH STUDY PAPER 1: STUDY DESIGN AND RESPONSE BIAS

O'Toole BI, Marshall RP, Grayson DA, Schureck, RJ, Dobson, M., French, M., Pulvertaft, B., Meldrum, L., Bolton, J., Vennard, J.. The Australian Vietnam veterans' health study: I. Study design and response bias. International Journal of Epidemiology 1996; 25(2): 307-318.

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The Australian Vietnam Veterans Health Study: I. Study Design and Response Bias

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Background. The Australian Vietnam Veterans Health Study was set up to examine the post-war health of former soldiers 20 or more years after service and to examine the relation of combat exposure to physical and mental health.

Method. A prospective cohort study of a simple random sample of 1000 male Australian Army Vietnam veterans used information gathered from Army records, from personal interview and questionnaires. Military records were used to examine response bias by determining the differences between 641 interviewed veterans, 50 known deceased veterans and 309 non-respondents (including 48 refusers and 213 non-traceable).

Results. Differences were evident between respondents and non-respondents, with logistic regression modelling pointing to pre-enlistment employment, antisocial behaviour, intelligence and post-Vietnam AWOL (absent without leave) as the most important discriminants, with non-respondents performing worse. Compared to respondents, deceased left school earlier, had higher rank in Vietnam and at discharge, had a higher overall number of charges but not a higher rate overall, and were less likely to have gone AWOL. Deceased also received more casualty reports than respondents and non-respondents, were better behaved during service, and were better emotionally adjusted than non-respondents. Respondents compared with the Australian population had equivalent or better current socioeconomic status.

Conclusion. There seems little bias due to non-response, but deceased tend to come from an older cohort than the other two groups.

Keywords: Vietnam veterans, response bias, combat

Cohort studies[1–9] of military populations following World War II, the Korean War and the Vietnam conflict have revealed that the initial cost of participating in war, given survival, is an elevated suicide rate, particularly in the early years following the conflict[1,3] and particularly for those who have psychological problems during service.[7] Otherwise, the survival of military cohorts generally is superior to the general community, as expected, given the 'healthy worker effect'[10] and the screening that tends to produce a fitter and healthier subgroup of their generation.[5] However, morbidity endpoints, as distinct from mortality endpoints, have received far less attention and the question of whether there are long-term health effects for former soldiers attributable to war remains largely unanswered.[11,12]

Greater emphasis on the physical and psychological costs of war on former warriors has occurred since the end of the Vietnam war, amidst the persistent controversy concerning the effects of service in Vietnam on US and Allied Forces including Australia, particularly exposure to the chemicals used there.[13,14] The early major studies[15,16] of American service personnel did not settle the controversy, and fears of health effects of pesticide exposure, combat exposure or other severe stress exposure persisted.[17–20] In particular, the issue of aetiology of psychiatric disorder and the relative contribution of 'constitutional' factors and experiential factors remains controversial.[21–23]

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In America two large epidemiological studies of Vietnam-era veterans were conducted at the behest of the US government.[24–32] Despite the sophistication of the epidemiological methods employed in these studies, they do not shed unambiguous light on the issue of the health of Vietnam veterans and the contribution of war service to this. They found an excess of self-reported illness in Vietnam theatre veterans compared with non-Vietnam serving or non-military personnel and an excess of psychiatric disorders, particularly post-traumatic stress disorder (PTSD). However, there was not complete concurrence in their results.

As part of the Allied Forces in Vietnam, over 50 000 Australians served from 1964 to 1972,[33] with 500 losing their lives and 2500 receiving wounds.[34] The Australian government introduced military conscription in 1965 to provide further Army personnel to serve in Vietnam. Although the Australian commitment was proportionately less than the American commitment, with 3 500 000 Americans being sent to Vietnam and 55 000 losing their lives, the controversy that has raged in the US concerning the health effects of service in Vietnam has also occurred in Australia. The present study was conducted to examine the health of Australian veterans using a random sample of Australian Army Vietnam veterans, and data were chosen to permit regression-based aetiologic hypotheses testing. This paper is the first in a series of three which present the initial results using somewhat similar methods and measures as the previous American studies. This paper reports the study design and fieldwork results and examines the bias of non-response. It also compares the obtained sample with the general Australian population. Two companion papers respectively report physical and mental health and their relationship to combat.

METHODS

Following the controversy over the health effects of exposure to 'agent orange' a series of studies was commissioned by the Australian government (the Australian Veterans Health Studies, AVHS[35–37]) which reported on mortality in former National Service conscripts and on birth defects but did not proceed with a planned morbidity study in spite of calls by a Royal Commission.[38] At the close of AVHS in 1984 the Australian Army received data tapes from the studies relating to military matters. Among these was a postings file developed to determine the strength on a daily basis of each unit assigned to Vietnam; it contained a record for each tour of duty for each person posted officially to Vietnam.[37] From this a list of Regimental Service Numbers was made available for the current study, from which a random sample of 1000 was selected. The Army supplied the full name, date of birth and corps to enable tracing of each man. The majority of the Australian Force Vietnam comprised Army members (approximately 42 000), however Navy (approximately 2800) and Air Force (approximately 4400) were also represented, as were civilian public servants, embassy personnel and civilian entertainers. Groups other than Army were not selected because of a greater heterogeneity of experiences and exposures and because of the differing availability, quality and contents of personnel records. The study was also restricted to male Army veterans, although a small number of women also served in Vietnam, mainly in nursing and administrative capacities.

To obtain residential addresses for contact, all names were submitted to independent computerized searches of the Australian Electoral Roll (voting, hence registration, is compulsory in Australia) and the Defence Service Homes Corporation (the major housing lender for ex-service personnel). In addition, independent manual searches were undertaken in the Department of Veterans Affairs (DVA) and the Vietnam Veterans Counselling Service (VVCS). As well as these government sources, the Returned Services League branches in the states of Victoria, Western Australia, Tasmania and South Australia assisted in location of veterans, as did the Vietnam Veterans Association of Australia, which also notified known deaths, and the 1987 'Welcome Home Parade' and the Vietnam Veteran Memorial Committees.

At the time of commencing fieldwork it was known that 8 of the 1000 randomly selected veterans had died in Vietnam. If an address was not available for the remainder after the register searches above, subsequent searches were conducted in Telecom telephone directory listings Australia-wide and in five of the eight Death Registries in Australia, and DVA provided results of death searches carried out by them in all states. Veterans were contacted by letter informing them of the study and seeking their participation. They were asked to return a postcard containing a participation consent form and asked for their Regimental Service (Army) Number, to permit clear identification. Veterans who were willing to participate were then contacted by telephone to arrange a personal interview either in their own homes, at offices of the VVCS, or another veteran-specified location (including ex-service clubs, worksites and prison).

Veteran subjects were interviewed in-person by the study team principal investigators and assistants

(351 interviews; 54.8%), together with volunteer Counsellors from the VVCS (250 interviews; 39.0%) and volunteer members of the Australian Army Psychology Corps (40 interviews; 6.2%). Interviews were conducted nationally between July 1990 and February 1993 and took on average 4 hours (range 3 to 9 hours, depending upon morbidity). They were structured to include, in order: physical health, then self-report psychological tests, then Vietnam experiences and assessment of combat-related PTSD, concluding with general psychiatric assessment. A self-completion questionnaire was given to respondents for mail-back. The instruments comprised, in order of presentation:

Health Interview

A standardized health interview, developed by the Australian Bureau of Statistics (ABS) for use in the 1989–1990 Australian Health Survey[39] was used, consisting of questions on health service utilization, recent and chronic illness, prominent 'risk factors' (alcohol, smoking, exercise) and standard demographic questions. This was included to allow direct comparison of veterans' surveyed health with the Australian population. The ABS supplied the questionnaire and copies of the fieldwork, office, editing and coding manuals used in the national survey. Interviewer training was undertaken by the principal investigators and fieldwork, coding and data entry supervised centrally by the principal investigators.

Self-Report Tests

A booklet of self-completion psychological tests was administered following the ABS interview; this comprised the Centre for Epidemiological Studies-Depression inventory (CES-D),[40] the Speilberger (Trait) Anxiety Inventory,[41] the 28-item General Health Questionnaire (GHQ),[42] a measure of marital adjustment the Spanier Dyadic Adjustment Scale,[43] a seven-item combat index,[44] the Mississippi scale for combat-related PTSD,[45] and the Army Self Description Inventory,[46] a 52-item quasi-personality test used by the Army mainly as an interview guide at enlistment, but which was found in the AVHS feasibility study[47] to correlate 0.78 with the neuroticism dimension of the Eysenck Personality Inventory,[48] and for which enlistment data were available.

PTSD Diagnosis

A standardized psychiatric diagnostic interview, the AUSCID-V for Vietnam-related PTSD was used, derived from the PTSD module of the Standardised Clinical Interview for DSM-III (SCID).[49] This interview began with a general orientation to Vietnam and the perceived effects of Vietnam service on subsequent life, followed by a combat index,[50] and then a section eliciting vignettes of traumatic exposures in Vietnam which were initially or had been recurrently distressing. This established the 'A' criterion for PTSD. The events described were ranked and the 'worst' event assessed in terms of dissociative, cognitive and autonomic reactions; then the symptom inventory of the SCID NP-V was administered.

General Psychiatric Assessment

As in the American studies, the Diagnostic Interview Schedule (DIS) of the American Psychiatric Association[51] (November 1987 version) was used, with modules including somatization disorder, depression and related disorders, anxiety disorders, PTSD, alcohol, drugs, gambling, and antisocial personality; modules for psychotic illnesses were not included as it was expected that prevalences would be very low, and such illness also would be likely to be patent during military service resulting in a lower chance of being sent on active duty overseas. The DIS has been shown to be a reliable instrument for psychiatric diagnosis in epidemiological studies in the hands of clinical and non-clinical interviewers[51] and formed the major tool for psychiatric assessment in the Epidemiologic Catchment Area studies[52,53] of psychiatric morbidity in the US.

The mail-back self administered questionnaire contained attitudinal, social network, parental and early upbringing questions, legal, welfare, and current circumstances questions, and questions on history of VVCS treatment. Interviewers were trained in residential training sessions and given extensive instruction in the DIS, the AUSCID and the ABS interviews.

In addition, data were extracted from Central Army Records Office and Psychology Records of the Army Psychology Corps, military records which were found to be of value in earlier studies of Australian Vietnam veterans.[36,54–56] The military data were obtained on the entire sample cohort (with one missing record), although various items contained varying amounts of missing data. The military data were collected to characterize the sample in terms of information available from a time before it was known that the man would serve in Vietnam and to obtain estimates of the bias of non-response enabling regression-based adjustment for non-response for each of the prevalence estimates. Army data included type of enlistment ('Regular' versus National Service), service details (postings, dates, service milestones), conduct and casualty information, pre-enlistment education and employment, and the results of Army psychology classification tests. The tests comprise the Australian Army General Classification

test (AGC), a 100-item general intelligence test that has been found to correlate highly (r = 0.8) with the Ravens Progressive Matrices,[47] the Army Speed and Accuracy (clerical aptitude) test (ASA), the Mechanical Comprehension (MC) test, and the Self Description Inventory (SDI) described above which was re-administered as part of the self-completion test battery. These tests (except SDI) are periodically normed on military populations and scaled scores produced with a range of 1–20, mean of 10.5 and standard deviation of 4.

Non-Response Adjustment

The statistical relationships of each of the Army variables to non-response were examined individually using tests appropriate to the scale of measurement of each variable. For subselection of data items for regression adjustment, instead of setting statistical significance (alpha rate) at the traditional 0.05, the criterion was relaxed to 0.1 in order to permit more sensitivity to detect potentially disturbing variables and to thus evaluate more rather than fewer variables in the multivariate analysis that searched for sample bias. Thus, 32 variables were found that discriminated between interviewed and not interviewed/not dead. Several of these were highly correlated, such as age at and date of enlistment, age at departure and date in Vietnam, age at and date of discharge. In these cases, the collinear variables were replaced by the age indicator variables and date data omitted, leaving 29 variables for regression analysis. Thus, 29 variables were considered for multivariate analysis, of which 11 had *P*-values less than 0.05.

Adjustment proceeded according to standard principles (see Appendix): the 29 Army variables were examined for their relationship to morbidity in the interviewed (641) sample, and a forward stepwise logistic model describing the multivariate relationship was computed. This model was then applied to the non-interviewed group and an estimated probability of illness calculated for each non-interviewed subject. This was then summed over the non-interviewed subjects to produce an estimated frequency, which was then added to the observed frequency in the interviewed group to produce a combined estimate of frequency (prevalence) in the whole alive sample of 950. This 'adjusted' prevalence was then compared with the prevalence expected when the Australian population was age-standardized against the eligible (950) veteran sample. To calculate a pseudo 'age-at-interview' for the non-interviewed subjects the date of the midpoint of fieldwork (15 November 1991) was imputed, by which time 59.6% of interviews had been conducted.

Measuring Combat Exposure

In the absence of a direct objective measure of combat exposure,[37] potential for exposure to 'high war zone stress'[27,28,44,50] was measured indirectly both from military records and from self report interview measures. A scaled measure was available from Army records based on the roles that individual units played, as advised by military advisers to AVHS,[37] which independently grouped the units which had been present in Vietnam into six, depending on their role and presence on the field and thus proximity to combat:

(1) High combat—Australian Army Training Team Vietnam (military advisers who worked individually with villagers), Special Air Service (commandos), and some Signals squadrons;
(2) Combat—Infantry, some field Engineers (mine clearance teams), some Armoured (tanks) and Cavalry Regiments (personnel carriers and convoy escort), 1 Field Squadron Workshop;
(3) Protected Combat—Artillery;
(4) Non-combat field presence—some Signals squadrons, some Transport squadrons, some Service Units, Aviation;
(5) Non-combat possible field presence—some Signals squadrons, some HeadQuarters units, some Workshop units;
(6) Non-combat non-field—Field Hospital, some HeadQuarters units, some postal units.

These were then weighted by the length of time each man was posted to each unit, aggregated over all tours, to produce a continuous scaled measure of exposure to combat (as judged by Army advisers to AVHS) which is not influenced by veterans' self-report.

Self-reported combat exposure was assessed at interview using a 21-item scale derived from Wilson and Krauss[50] which asked the frequency of experiencing each of 21 specified events, such as direct enemy contact, seeing Australians killed or wounded. Each item was coded on a scale of frequency of exposure to each event: never (0), once (0.25), 2–5 times (0.5), 6–10 times (0.75) and more often (1.0). Scales were computed with a range of 0 (no combat) to 21 (extreme combat). The correlation between the measures of combat exposure based on postings and on self-report was only moderate, at 0.44, although statistically significant ($P < 0.001$).

STATISTICAL METHODS

The sample was grouped into three: those who were interviewed (n = 641), those who were known dead (n = 50) and those who were not interviewed and not

TABLE 1 *Comparison of selected service characteristics among the three respondent groups: interviewed, known dead, and not interviewed/not known dead*

	Interviewed (n = 641)	Not interviewed (n = 309)	Dead (n = 50)
Enlistment year: Range	1938–1971	1940–1970	1942–1970
Median	1966	1966[a]	1962[b,c]
Mean (SD) age at enlistment	20.3 (2.4)	20.4 (2.4)	21.5 (3.8)[b,c]
Enlistment route (% Conscript)	48.2	48.2	34.0
Enlistment corps (% in Arms corps)	56.7	59.6	54.0
Mean (SD) age at first tour	23.8 (5.2)	23.4 (4.7)	28.4 (8.7)[b,c]
Mean (SD) age at first homecoming	24.6 (5.2)	24.2 (4.7)	29.2 (8.6)[b,c]
Mean (SD) length of military service before Vietnam (years)	3.5 (4.7)	3.0 (4.1)	7.0 (6.5)[b,c]
Mean (SD) length of Vietnam service (months)	9.6 (3.4)	9.5 (3.3)	8.7 (3.8)[b]
Posted to combat unit (%)	59.8	63.4	52.0
Became casualty (%)	10.8	10.4	20.0[b,c]
Two or more tours (%)	7.7	7.4	8.0
Mean (SD) total Army service (years)	9.1 (9.5)	7.7 (8.1)[a]	11.8 (1.3)[b,c]
Mean (SD) age at discharge:	29.5 (9.7)	28.2 (8.2)	33.2 (11.4)[b,c]
Discharge rank:			
% Private	50.5	51.8	28.0[b,c]
% Corporal	17.9	21.8	18.0
% Sergeant	9.9	11.4	26.0
% Warrant Officer	12.7	9.4	18.0
% Commissioned Officer	9.0	5.5	10.0

[a] Statistically significant difference ($P < 0.05$) between interviewed and not-interviewed/not-dead subjects.
[b] Statistically significant difference ($P < 0.05$) between dead and interviewed subjects.
[c] Statistically significant difference ($P < 0.05$) between dead and not-interviewed/not-dead subjects.

known dead (n = 309) and the distributions of each of the military record variables across the three groups were compared. One contrast compared interviewed with not-interviewed/not-dead subjects, others compared the dead with each of the other two groups. Not all Army record data were present for each subject; indicator variables of missing data were computed for each variable to determine whether data could be considered to be missing at random (i.e. where there was no significant relationship between group and missing items). Highest class reached at school was more often missing for the dead than the other two groups, while the number of months of pre-enlistment employment was more often missing for the not-interviewed. This could indicate that there had been no employment prior to enlistment, however there may have been a genuine oversight when the record was raised. No other indicators of missing data discriminated across the groups. Logistic regression models were computed using the variables that statistically discriminated between the pairs of groups, in order to explore the relative contributions to potential response bias and to characterize the obtained sample, particularly insofar as the interviewed subjects may differ from the deceased or the non-interviewed.

RESULTS

In addition to the eight who had died in Vietnam, a further 42 were found to have died in Australia or elsewhere after the war. There were 213 who could not be found; 48 refused to participate and a further 13 who were initially willing later refused interview. A total of 641 veterans participated in interviews; the remaining 35 who did not refuse were unable to be interviewed, mostly because of inability to make a convenient interview time (often due to the veteran's occupation, for example, long distance truck driver, itinerant country teacher, etc.). Thus the study achieved a refusal rate of only 4.8%, but a non-contact rate of 21.3%, and a response rate of 67.5% (641/[1000–50]) of those not known to have died or 87.0% (641/[1000–50–213]) of those who could be found alive.

Table 1 shows the age and epoch data comparisons of respondents, non-respondents, and the dead. Few differences are evident between the interviewed and the not-interviewed/not-dead. These groups enlisted, served in Vietnam and came home at similar ages; their length of service in Vietnam and before Vietnam was similar, although not-interviewed subjects tended to enlist in earlier years than interviewed subjects ($t = 2.02$, $P = 0.028$) and to serve in the Army for

TABLE 2 *Comparisons of pre-enlistment information obtained from military records for those who were interviewed, those who were not interviewed but not known dead, and those who were known dead*

	Interviewed (n = 641)	Not interviewed (n = 309)	Dead (n = 50)
Pre-enlistment education:			
Mean (SD) age left school	15.4 (1.2)	15.2 (1.2)	15.0 (1.2)
Mean (SD) years of schooling	9.7 (1.4)	9.6 (1.4)	9.1 (1.5)[b]
Highest class reached			
Intermediate or less (%)	39.2	45.2	55.5[b]
Pre-enlistment employment:			
Mean (SD) number of jobs	2.5 (1.7)	2.7 (1.7)[a]	3.0 (1.7)
Mean (SD) months employed	46.3 (28.6)	50.8[a] (27.7)	65.0 (44.1)[b]
Pre-enlistment trade training (%):	13.1	14.6	15.2
Enlistment Psychology tests:			
Mean (SD) AGC score	13.4 (3.4)	12.5 (3.6)[a]	12.5 (3.2)[b]
Mean (SD) ASA score	13.2 (3.9)	12.6 (3.8)[a]	13.3 (3.9)
Mean (SD) MC score	14.5 (3.7)	14.0 (3.9)	14.1 (3.1)
Mean (SD) SDI score	6.1 (4.4)	6.5 (4.8)	5.1 (3.7)

[a] Statistically significant difference ($P < 0.05$) between interviewed and not-interviewed/not-dead subjects.
[b] Statistically significant difference ($P < 0.05$) between dead and interviewed subjects.
[c] Statistically significant difference ($P < 0.05$) between dead and not-interviewed/not-dead subjects.

shorter periods overall (t = 2.34, $P = 0.02$). There were similar proportions of National Servicemen (conscripts) in the two groups, they were assigned to the Arms Corps (Infantry, Armour, Artillery, etc.) in similar proportions and they were discharged from the Army at approximately the same ranks.

Those who were known to have died, on the other hand, were different from both the other two groups: they were born in earlier years (t = 3.78, $P < 0.001$; t = 4.22, $P < 0.001$, respectively for deceased-interviewed and deceased-not-interviewed contrasts) and enlisted in earlier years (t = 3.69, $P = 0.001$; t = 4.33, $P < 0.001$, respectively) but at older ages (t = 3.05, $P = 0.002$; t = 2.69, $P = 0.007$ respectively); they were older when they went to Vietnam (t = 5.94, $P < 0.001$; t = 6.22, $P < 0.001$ respectively) and thus were older on homecoming (t = 3.68, $P = 0.001$; t = 3.98, $P < 0.001$ respectively); they had longer service before Vietnam (t = 3.71, $P < 0.001$; t = 4.20, $P < 0.001$), shorter service in Vietnam than interviewed subjects (t = 2.00, $P = 0.045$) but not non-interviewed subjects (t = 1.53, $P = 0.126$), had longer service in the Army overall than either of the other two groups (t = 1.99, $P = 0.046$; t = 2.92, $P = 0.004$ respectively) and were older at discharge (t = 2.28, $P = 0.027$; t = 3.01, $P = 0.004$ respectively) thus they tend to belong to an earlier cohort of men than the others. They sustained no more casualties while in Vietnam and were not more likely to be posted to a combat unit during their tour. Fewer were discharged at the rank of private and the overall distribution of ranks was significantly different ($\chi^2 = 15.59$, d.f. = 4, $P = 0.006$; $\chi^2 = 15.43$, d.f. = 4, $P = 0.004$ respectively). While fewer of them were National Servicemen than the other two groups, this was not statistically significant ($\chi^2 = 3.21$, d.f. = 1, $P = 0.073$; $\chi^2 = 2.95$, d.f. = 1, $P = 0.086$ respectively).

Table 2 shows the variables derived from psychology records. Again, the interviewed and not-interviewed/not-dead were quite similar in age left school, number of years of schooling and highest class reached. There were also few differences in employment before entering service, except that interviewed subjects tended to have shorter periods of employment before joining the Army (t = 2.45, $P = 0.019$) and to have fewer jobs (t = 2.11, $P = 0.034$). For the Army psychology battery, not-interviewed subjects tended to score lower on the general classification test (AGC) than interviewed subjects (t = 3.66, $P < 0.0005$) as well as on the clerical ability test (ASA; t = 2.04, $P = 0.042$) and they had a lower mean score on the mechanical aptitude test (MC), although this was of marginal significance (t = 1.89, $P = 0.059$). The deceased, on the other hand, did not differ from the interviewed group

TABLE 3 *Comparisons of conduct and behaviour information for those who were interviewed, those who were not interviewed but not known dead, and those who were known dead*

	Interviewed (n = 641)	Not interviewed (n = 309)	Dead (n = 50)
Pre-enlistment civilian criminal record (%)	9.6	13.0	15.2
Offence during service:			
Pre-Vietnam (%)	37.3	45.0[a]	48.0
Post-Vietnam (%)	16.1	22.3[a]	22.0
Pre-Vietnam charges:			
Aggression (%)	6.6	10.7[a]	18.0
Criminal (%)	1.1	1.0	6.0
AWOL (%)	19.1	23.6	26.0
Minor military (%)	19.5	26.9[a]	26.0
Post-Vietnam charges:			
Aggression (%)	3.8	5.8[a]	8.0
Criminal (%)	0.6	1.3	0.0
AWOL (%)	6.9	13.9[a]	8.0
Minor military (%)	8.4	10.4	14.0

[a] Statistically significant difference ($P < 0.05$) between interviewed and not-interviewed/not-dead subjects.

except in not reaching as high a class at school ($t = 2.23$, $P = 0.026$) and being employed for a longer period before enlistment ($t = 2.64$, $P = 0.012$). They also did not differ statistically significantly ($P > 0.05$) from the non-interviewed/not-dead group for any other variable in Table 2.

Table 3 shows conduct and behaviour information for the three groups. Note that during service multiple charges could have been accumulated. Compared with interviewed subjects, those who were not interviewed/not known dead were more likely to have been charged with at least one offence in the Army both before going to Vietnam ($\chi^2 = 4.76$, d.f. = 1, $P = 0.029$) and after return ($\chi^2 = 5.05$, d.f. = 1, $P = 0.025$); there was no difference in pre-enlistment civilian 'criminal records' (usually minor offences—major offences would have prohibited enlistment) but before going to Vietnam the non-interviewed were more likely to be charged with aggression charges ($\chi^2 = 4.30$, d.f. = 1, $P = 0.038$), with more minor military charges ($\chi^2 = 6.12$, d.f. = 1, $P = 0.013$) and they went AWOL more often after return ($\chi^2 = 11.57$, d.f. = 1, $P = 0.0007$). On the other hand, none of the differences between the deceased and either of the other groups was statistically significant ($P > 0.05$) for any variable in Table 3.

Charge rates for each of the categories in Table 3 were computed to control for varying time periods in the Army before Vietnam, in Vietnam, after Vietnam and overall. These showed that there were no differences in charge rates in Vietnam, which were uniformly lower than at other times. The non-interviewed veterans had higher rates of charges overall than interviewed veterans ($t = 2.99$, $P = 0.004$), both before Vietnam ($t = 3.52$, $P = 0.0002$) and after return ($t = 3.46$, $P = 0.001$); their rate of AWOL charges pre-Vietnam was higher ($t = 3.02$, $P = 0.003$) as was their rate of minor military charges ($t = 2.76$, $P = 0.006$); their rate of AWOL charges after return from Vietnam was higher ($t = 3.70$, $P = 0.0001$) as was their rate of aggression charges ($t = 2.24$, $P = 0.026$) but not minor military charges overall. The deceased, on the other hand, did not differ significantly from either of the other groups.

The interviewed and the non-interviewed/not-dead groups were compared and the known dead were compared with each of the other two groups using logistic regression, to reveal the major contributors to response bias. As there was no a priori grouping that would guide the order of entry of variables in the analysis, a forward stepwise procedure was adopted. This strategy omits variables that are not significantly related to group membership or which are linear combinations of those variables already admitted into the model. The results appear in Table 4. Rank in Vietnam and at discharge differentiated the deceased from the interviewed but not the non-interviewed; pre-Vietnam AWOL differentiated the deceased from either of the other two

TABLE 4 *Odds ratios and 95% confidence intervals for variables in forward stepwise logistic regression models comparing interviewed, not interviewed-not known dead and the known dead*

	Interviewed versus not interviewed	Dead versus interviewed	Dead versus not interviewed
Age left school	–	0.716 (0.835, 0.615)	–
Number of jobs	0.993 (0.908, 0.996)	–	–
AGC score	1.017 (1.011, 1.025)	–	–
SDI score	–	–	0.864 (0.807, 0.925)
Civilian criminal record	–	–	16.121 (4.266, 60.922)
Rank in Vietnam	–	0.396 (0.302, 0.524)	–
Pre-Vietnam charges	–	–	0.377 (0.229, 0.619)
Pre-Vietnam charge rate	0.794 (0.713, 0.883)	–	–
Pre-Vietnam AWOL rate	–	0.002 (0.001, 0.033)	3×10^{-5} (1×10^{-7}, 0.009)
Pre-Vietnam total charges	–	–	2.045 (1.591, 2.627)
Post-Vietnam military charges	–	–	1.481 (1.186, 1.849)
Post-Vietnam AWOL	0.671 (0.585, 0.769)	–	–
No. casualty reports	–	3.206 (2.152, 4.775)	5.658 (3.316, 9.656)
Total charges	–	1.378 (1.242, 1.528)	–
Discharge rank	–	1.981 (1.557, 2.519)	–

groups but did not discriminate between the interviewed and the not-interviewed groups; similarly with the number of casualty reports; post-Vietnam AWOL discriminated between the interviewed and not-interviewed but not between either of these and the deceased; AGC score discriminated between interviewed and non-interviewed but not between these and the deceased. In all of these, the not-interviewed group tended to perform more poorly than the other two groups.

Selected demographics of the obtained sample at the time of interview appear in Table 5 together with the distributions of the Australian population represented by the ABS Health Interview Survey 1989–1990. The population age distribution is shown only for the age range of the veterans. The remaining population distributions have been age-standardized to the veteran sample. The educational profile of the veterans was different from that of the Australian population: they tended to be younger at completion of school, while similar numbers had trade qualifications, more had certificates or diplomas and fewer held tertiary qualifications. The veterans' employment profile was very similar to the population, although their incomes tended to be higher.

DISCUSSION

Several follow-up epidemiological studies have reported differences between respondents and eligible non-respondents,[57–60] particularly refusers.[61] In particular, the conservative assumption is sometimes warranted, that non-respondents in morbidity studies have a greater burden of illness, thus prevalence can be assumed to be underestimated. In this study, only a few differences were found between those who were interviewed and those who were eligible (i.e. not dead) but not interviewed. It is possible that behavioural characteristics may differentiate the not-interviewed group, in that they experienced various charges at higher rates while they actually served for a shorter time in the Army, had fewer who completed secondary education, had more with jobs and were employed for longer before joining the Army. These tendencies may have implications for other, more important, variables that are related to morbidity.

The deceased, on the other hand, differed from both the other groups: they were generally from an older birth cohort, more likely enlisted as Regular soldiers at an older age, served for longer in the Army before Vietnam, were older in their tour, served longer in the Army and were discharged older and at higher ranks. Interestingly, they did not share the military profile that characterized the deceased compared to living Australian National Servicemen (conscripts) in the AVHS mortality study.[36,54–56] In that study AGC score, employment instability, overall AWOL charges, alcohol and motor vehicle-related charges were important in the final model of all-cause mortality.[54] None of these was important here in discriminating the known dead from the interviewed or non-interviewed groups except AWOL charges, which were lower among the deceased.

TABLE 5 *Sociodemographic characteristics of the Australian Vietnam veteran sample compared with the expected distribution for the age-sex matched Australian population*

	Vietnam veterans		Australian population	
	n	%	n	%
Age group[a]:				
35–39	5	0.8	125.0	19.5
40–44	267	41.7	114.5	17.9
45–49	255	39.6	91.3	14.2
50–54	50	7.8	74.0	11.5
55–59	30	4.7	70.5	11.0
60–64	24	3.8	66.0	10.3
65+	10	1.5	99.7	15.6
Employment:				
Employed	545	85.4	555	86.6
Unemployed/looking	17	2.7	22	3.5
Not in labour force	76	11.9	64	9.9
Yearly income (Aus$):				
<$10 000	12	1.9	66	10.3
$10 000–19 999	72	11.2	99	15.4
$20 000–29 999	129	20.1	158	24.6
$30 000–39 999	158	24.7	131	20.5
$40 000–49 999	103	16.1	68	10.6
$50 000–59 999	63	9.8	34	5.3
>$60 000	75	11.7	44	6.9
Highest education:				
School only	234	36.5	268	41.8
Certificate/diploma	169	26.4	107	16.8
Trade/apprenticeship	162	25.3	178	27.7
Tertiary degree	46	7.2	82	12.7
Other	28	4.6	5	0.8
Age completed school:				
18 years or older	35	5.5	85	13.2
15–17 years	441	69.2	416	64.8
Under 15 years	161	25.3	139	21.7

[a] Age group for the Australian population is what would be expected given the veterans' age range; all other variables are age-adjusted to the veteran distribution.

The clear conclusion from the results of the fieldwork is that there may be only a small bias due to non-response, which gives confidence in the internal validity[62,63] of the study. Compared with the Australian population, the sample seems less well-educated although not disadvantaged in employment status or income. Comparing the Australian and American studies may need to take account of service and perhaps racial and cultural differences between the two countries, and there could also be differences due to the samples of subjects used in the three studies, or to the factors that are associated with non-response. The present study was conducted up to 5 years later than the US studies and Australians had enlisted generally earlier than the American samples, making them generally older at interview. The CDC also found that non-participation in their medical (second stage) examination was predicted by reports of stress, anxiety, depression, memory and concentration symptoms and that other problems such as 'feeling life was hopeless' led to higher attrition rates. Those who participated in the medical examination tended to be slightly better educated but more frequently reported certain medical conditions or psychological conditions at the earlier interview. While CDC found that type of discharge, discharge rank and general technical test score (similar in function to the Australian Army AGC test) had the strongest association with participation rates, the participation rate differences did not markedly alter the distribution of conditions after adjustment. The NVVRS also found that respondent veterans tended to be better educated, career personnel who were Vietnam veterans were more

likely to respond, and that responding Vietnam theatre veterans were more likely to enter service between 1940 and 1954 than non-respondents. They adjusted statistically for interview-level non-response for the variables defined by cohort (Vietnam theatre, Vietnam era, non-veteran), gender, race/ethnicity (for men only) and for nurse/non-nurse occupation in their sample of women; these adjustments also did not change prevalence estimates greatly. Compared to the NVVRS, the Australian sample was somewhat similar except in branch of service and number of tours and confining attention to white males for the NVVRS (where possible) enables direct comparison with the present results.

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APPENDIX

This Appendix describes explicitly the technique used to compute prevalences and other endpoints adjusted for non-response in this paper and in the companion paper reporting psychiatric morbidity. Of 950 subjects not known to be dead, interviews were completed on 641; in general, Army data existed on all of the original sample of 1000. We first selected the variables that showed a significant difference between our interviewed sample (n = 641) and the non-interviewed/not-dead sample (n = 309), which also independently were differentially distributed between dead and each not-dead subject group. We used a criterion of 0.10 rather than the usual 0.05 in order to be more confident that this initial set of potentially relevant variables did not omit variables important to morbidity endpoints. The endpoints involving rates used logistic regressions and those that were (semi-)continuous used ordinary regression.

For each endpoint, we built a model using only the 641 interviewed subjects (who had data on both the endpoint and the Army variables) using a forward stepwise selection procedure on the 29 significant ($P < 0.10$) Army variables, using a P-in criterion of 0.10 and P-out criterion of 0.15. As noted in the text, sometimes a model predicting the endpoint from Army data was not acquired using this procedure (i.e. none of the 29 Army variables was marginally or singly significant at 0.10). Having obtained a model from Army data predicting the endpoint on the interviewed (a different model for each endpoint), we could then predict the endpoint on the 309 not-interviewed/not-dead subjects as we had the Army data regressands measured on them. Prevalences and average endpoints, adjusted for non-response in this manner, were then obtained by averaging the predicted values over all 950 subjects. This technique has the following property for logistic and ordinary regression: the average predicted value equals the average observed value among those on whom the model was fittted—the 641 interviewed subjects.

In more detail, let Y_i denote the endpoint observation on subject i, either a 1 or 0 for case data, or a continuous observation. Represent the computed model-predicted value by $y_i = f(x_i'b)$; where $x_i'b$ represents the linear kernel predicted from the intercept and the Army variables x_i for subject i, obtained from maximum likelihood logistic or ordinary regression; and where f is the identity function $f(z) = z$ in ordinary regression and $f(z) = e^z/(1 + e^z)$ in logistic regression. Let Y_{Int} and y_{Int} denote averages of Y_i and y_i over the 641 interviewed subjects; and let y_{NInt} denote the average of the scores y_i (computed from Army data) over the 309 non-interviewed/not-dead subjects. Then we define our average endpoints, adjusted for non-response as

$$y_{Adj} = (641Y_{Int} + 309y_{NInt})/950$$

Note that among the 641 interviewed, the average predicted and observed endpoints are equal—$y_{Int} = Y_{Int}$. This follows from the normal equations, in both logistic regression and ordinary regression (in particular, from the normal equation obtained by partially differentiating the likelihood with respect to the intercept parameter). In ordinary regression, this fact is embodied in the statement that the average of the (fitted) residuals is zero. The same is true with logistic regression.

APPENDIX 2.2 – LIST OF VARIABLES EXAMINED WITH EXCLUSIONS IDENTIFIED

Block of Factors	Measure	Range	High score	Mean (SD)	Whether in Model (1)
Age	**1. Age when interviewed (in 5yr intervals)**		Older	9.86 (1.21)	1
Physical Health	**2. Each veteran high risk diagnosis**		More dx	0.71 (0.92)	1
	3. Each veteran low risk diagnosis		More dx	1.34 (1.15)	1
	4. Total physical diagnoses		More dx	2.05 (1.57)	
Mental Health	5. Distress at interview	0-14	Distressed	2.41 (2.94)	
	6. GHQ continuous score	0-28	More sx	6.98 (4.22)	
	7. Level of depression	0-20	Depressed	3.97 (4.38)	1
	8. Marital dysfunction	0-32	More sx	9.52 (4.83)	1
	9. Mississippi score total	35-175	More sx	73.80 (21.74)	
	10. PTSD lifetime diagnosis	0-1	Present	0.21 (0.41)	
	11. Total avoidance score from SCID interview	0-20	More sx	9.35 (3.27)	
	12. Lifetime agoraphobia symptoms	0-5	More sx	0.11 (0.50)	
	13. Lifetime social phobia symptoms	0-5	More sx	0.49 (0.97)	
	14. Lifetime simple phobia symptoms	0-9	More sx	0.70 (1.11)	
	15. Lifetime alcohol symptoms	0-9	More sx	2.09 (2.38)	1
	16. Level of anxiety	0-10	Anxious	2.78 (2.32)	1
	17. PTSD current diagnosis	0-1	Present	0.11 (0.32)	1
	18. Total phobia symptoms	0-5	More sx	1.30 (1.94)	1
	19. Alcohol dependence/abuse diagnosis	0-1	Present	2.01 (1.81)	
Predisposition	**20. Measured intelligence level**	0-20	Hi intel	13.61 (5.08)	1
	21. Personality self orientation symptoms	0-7	More sx	0.67 (0.94)	1
	22. Antisocial personality indicators	0-10	More sx	1.79 (1.81)	1
	23. Personally reluctant to go to Vietnam	0-1	Anti	0.23 (0.23)	1
	24. Significant others opposed deployment	0-3	Anti	1.60 (0.71)	1
	25. Personally committed to Vietnam war	0-1	Pro	0.76 (0.22)	1
	26. Felt ill-trained or prepared		Problems	0.23 (0.21)	1

	27. Age at start of first deployment	16-52	Older	23.80 (5.24)	1
	28. Non-combat stressors during deployment	0-14	Hi stress	1.04 (1.40)	1
	29. Educational difficulties	0-3	Edn probs	1.37 (0.55)	1
	30. Family stress symptoms pre-deployment	0-8	Hi stress	1.37 (1.15)	
	31. Family socio-economic disadvantages	0-5	Ses probs	2.29 (0.66)	
	32. Father a WW2 veteran	0-1	Distressed	0.13 (0.27)	
	33. Pre-Vietnam social support problems	0-6	Problems	2.45 (1.01)	
	34. Veterans own dislike of Army service	0-3	Anti	0.19 (0.26)	
	35. Significant others dislike of Army service	0-1	Anti	1.10 (0.74)	
	36. Veterans own stress experiences pre-Vietnam	0-8	Hi stress	0.50 (0.93)	
	37. Veterans concern or fear of deployment	0-1	Terrified	0.25 (0.23)	
	38. Adult antisocial personality symptoms	0-30	More sx	2.12 (2.38)	
	39. Childhood antisocial personality symptoms	0-12	More sx	1.03 (1.59)	
	40. Pre-Vietnam relationship difficulties	0-4	More sx	1.81 (0.65)	
	41. Dissatisfaction with assigned role for deployment	0-1	Dissatisfied	0.25 (0.17)	
Deployment	**42. Deployed alone and not with a unit**	0-1	Alone	1.63 (0.54)	1
	43. Combat incident exposure	0-21	Hi combat	5.19 (4.05)	1
	44. Combat role of unit		Hi combat	3.24 (2.04)	1
	45. Disciplinary charges during service		More	1.61 (2.25)	1
	46. Years service experience pre-Vietnam (yrs)		Longer	3.46 (4.73)	1
	47. Discipline charges prior to deployment		More	0.88 (1.66)	
	48. Discipline charges during deployment		More	0.46 (0.86)	
	49. Discipline charges after deployment		More	0.27 (0.76)	
	50. Combat exposure index (Keane)	0-7	Hi exposure	2.28 (1.55)	
	51. Dissociation symptoms during critical incident	0-15	Hi dissoc	4.20 (3.21)	
	52. Time in Vietnam		Longer	1.05 (1.00)	
	53. Time in Army after deployment		Longer	4.60 (6.55)	
	54. Age at enlistment		Older	20.34 (2.42)	

	55. Total time in army until interview		Longer	9.11 (9.49)	
Repatriation	**56. Pleasure in leaving Vietnam**	0-2	Positive	1.75 (0.44)	1
	57. Amount talked about Vietnam 1st six mths	0-5	More talk	1.42 (0.89)	1
	58. Experience of discrimination over deployment	0-1	Often	0.31 (0.27)	1
	59. Reluctance to reveal veteran status	0-4	Often	1.23 (1.36)	1
	60. Arguments/fights over Vietnam involvement	0-2	Often	0.39 (0.44)	1
	61. Often think about Vietnam	0-1	Often	0.53 (0.23)	1
	62. Anger at others over Vietnam	0-2	Often	0.79 (0.57)	1
	63. Shame over Vietnam service	0-1	Often	0.07 (0.18)	1
	64. Gladness of others at return	0-6	Not glad	0.56 (0.81)	1
	65. No homecoming party provided	0-1	No party	0.63 (0.48)	
	66. Cool or indifferent reception by significant others	0-6	Bad	0.64 (0.83)	
	67. How often talked about Vietnam last 5 years	0-5	Often	1.53 (0.78)	
	68. Arrest since deployment civil and military		More	0.54 (1.58)	
	69. Current income level		Higher	38K (21K)	
Exservice involvement	**70. Active in Returned & Services League**	0-2	Active	1.11 (0.82)	1
	71. Active in Vietnam Veterans Association	0-2	Active	0.53 (0.82)	1
	72. Active unit association member	0-3	Active	0.57 (0.88)	1
	73. Closeness with other veterans	0-7	Closer	2.41 (2.24)	1
	74. Attendance at exservice organised meetings, ceremonies	0-9	Hi activity	3.24 (2.34)	

37

APPENDIX 2.3 – SELF-REPORTED HEALTH SURVEY FORM

I FIRST WANT TO ASK YOU ABOUT HOW YOU FEEL GENERALLY

1. WOULD YOU SAY THAT YOUR HEALTH IS ....

Excellent
Good
Fair
Poor

2. OVERALL, WOULD YOU SAY THAT YOU ARE ...

Very happy
Happy
Unhappy
Very unhappy

THE FOLLOWING QUESTIONS ARE ABOUT USE OF HEALTH SERVICES

3. HAVE YOU BEEN ADMITTED TO HOSPITAL IN THE LAST TWELVE MONTHS?

Yes
No - Go to Question 10

4. NOT COUNTING ANY TIMES YOU JUST WENT TO THE OUTPATIENTS CLINIC OR CASUALTY, HOW MANY TIMES HAVE YOU BEEN ADMITTED TO HOSPITAL IN THE LAST TWELVE MONTHS?

None - Go to question 10
Number _____

I WANT TO TALK ABOUT (THIS/YOUR MOST RECENT) STAY IN HOSPITAL

5. HOW MANY NIGHTS DID YOU STAY IN HOSPITAL?

None
7 nights or less
(please specify) _____
More than one week to less than two weeks
2 weeks to less than one month
One month or more

6. WAS THE HOSPITAL A PUBLIC OR A PRIVATE HOSPITAL?

Public
Private
Don't know

7. WERE YOU DISCHARGED FROM HOSPITAL IN THE LAST TWO WEEKS UP TO YESTERDAY?

Yes
No

8. HOW MANY NIGHTS IN THE LAST TWO WEEKS DID YOU SPEND IN HOSPITAL?

None
Number _____

9. WHAT MEDICAL CONDITIONS WERE YOU IN HOSPITAL FOR?

Interviewer: Prompt for condition if a treatment or symptom is reported.

1. _____

2. _____

3. _____

HOSPITAL CASUALTY/OUTPATIENT VISITS

THE NEXT FEW QUESTIONS REFER TO THE LAST TWO WEEKS UP TO YESTERDAY (Apart from when you were admitted to hospital)

10. HAVE YOU VISITED CASUALTY OR THE OUTPATIENTS CLINIC AT A HOSPITAL ABOUT YOUR OWN HEALTH IN THE LAST TWO WEEKS?

Yes
No - Go to question 13.

11. HOW MANY TIMES HAVE YOU VISITED CASUALTY OR THE OUTPATIENTS CLIENT AT A HOSPITAL ABOUT YOUR OWN HEALTH IN THE LAST TWO WEEKS?

Number _____

I WANT TO TALK TO YOU ABOUT (THIS/YOUR MOST RECENT) VISIT.

12. WHAT MEDICAL CONDITIONS DID YOU HAVE WHICH CAUSED YOU TO VISIT CASUALTY OR OUTPATIENTS?

Interviewer: Prompt for condition if a treatment or symptom is reported.

1 _____

2 _____

3 _____

RECENT ILLNESS - DOCTOR VISITS

13. HAVE YOU CONSULTED A DOCTOR OR SPECIALIST ABOUT YOUR OWN HEALTH IN THE LAST TWO WEEKS (APART FROM WHEN YOU STAYED IN HOSPITAL OR VISITED CASUALTY OF THE OUTPATIENTS CLINIC)

Yes - Go to question 15
No - Go to question 14

14. WHEN WAS THE LAST TIME YOU CONSULTED A DOCTOR ABOUT YOUR OWN HEALTH?

Less than 3 months ago
3 months to less than 6 months ago
6 months to less than 12 months ago
12 months or more ago

15. APART FROM WHEN YOU STAYED IN HOSPITAL OR VISITED CASUALTY OF THE OUTPATIENTS CLINIC) HOW MANY TIMES HAVE YOU CONSULTED A DOCTOR ABOUT YOUR OWN HEALTH IN THE LAST TWO WEEKS?

Number _____

I WANT TO TALK TO YOU ABOUT (THIS/YOUR MOST RECENT CONSULTATION)

16. WHAT WERE ALL THE CONDITIONS YOU HAD WHICH CAUSED YOU TO CONSULT THE DOCTOR?

Interviewer: Prompt for condition if a treatment or symptom is reported.

1 _____

2 _____

3 _____

17. AT (THIS/YOUR MOST RECENT) CONSULTATION, DID YOU CONSULT THE DOCTOR ....

At the doctor's office/surgery?
At your own home?
At a school, work or any other clinic?
Over the phone or through someone else?
Other

18. WAS THE DOCTOR CONSULTED A GENERAL PRACTITIONER OR A SPECIALIST?

General Practitioner
Specialist
Don't know

19. AT THIS CONSULTATION, DID THE DOCTOR ....

Give or arrange an injection?
Give or prescribe for you any medicine, tablets or other medication?
Make an appointment for you to see them again?
Make arrangements for you to be admitted to a hospital, or nursing or convalescent home?
Check your blood pressure?
None of these

20. DID THE DOCTOR TAKE OR ARRANGE ....

An X-ray?
A blood test?
A urine test?
Any other test?
None of these.

21. AT THIS CONSULTATION, DID THE DOCTOR REFER YOU TO ...

A/another specialist?
A/another general practitioner?
Any other person?

(If necessary ask ... WHO WAS THIS?)

Physiotherapist
District, home or community nurse
Social worker/Welfare officer/ Psychologist/Counsellor
Other
Not referred/none of the above

RECENT ILLNESS - OTHER HEALTH PROFESSIONALS

22. IN THE LAST 12 MONTHS HAVE YOU CONSULTED ANY OF THE FOLLOW PEOPLE ABOUT YOUR OWN HEALTH?

A chiropractor
An osteopath
A naturopath
A herbalist
An acupuncturist
A dietitian
None of these

23. HAVE YOU CONSULTED (THIS PERSON/ANY OF THESE PEOPLE) IN THE LAST TWO WEEKS?

No
Yes

24. IN THE LAST TWO WEEKS HAVE YOU CONSULTED ANY OF THE FOLLOWING PEOPLE ABOUT YOUR OWN HEALTH?

A chemist for advice
An optician/optometrist
A physiotherapist
A psychologist
A social worker/welfare officer
A counsellor
A nurse other than a dental nurse?
(Ask what type of nurse?)
School
Baby health
Other
None of these

25. Sequence Guide

If No OHP's consulted in last two weeks (refer to Q23 and Q24) go to Q33
Otherwise go to Q25.

26. Interviewer

Record the number of OHP's consulted in the last two weeks (refer to Q23 and Q24)

___|___

FIRST OTHER HEALTH PROFESSIONAL

27. HOW MANY TIMES IN THE LAST TWO WEEKS DID YOU CONSULT THE (specify first OHP in Q23 and Q24)

Number _____

28. I WANT TO TALK TO YOU ABOUT (THIS/YOUR MOST RECENT) CONSULTATION.

WHAT MEDICAL CONDITIONS DID YOU HAVE WHICH CAUSED YOU TO CONSULT THE (Specify first OHP from Q23 and Q24)?

Interviewer: Prompt for condition if a treatment or symptom is reported.

1 _____

2 _____

3 _____

SECOND OTHER HEALTH PROFESSIONAL

29. HOW MANY TIMES IN THE LAST TWO WEEKS DID YOU CONSULT THE (Specify second OHP from Q23 and Q24)?

Number _____

I WANT TO TALK TO YOU ABOUT (THIS/YOUR MOST RECENT) CONSULTATION.

23. WHAT MEDICAL CONDITIONS DID YOU HAVE WHICH CAUSED YOU TO CONSULT THE (Specify second OHP from Q23 and Q24)?

Interviewer: Prompt for condition if a treatment or symptom is reported.

1 _____

2 _____

3 _____

THIRD OTHER HEALTH PROFESSIONAL

31. HOW MANY TIMES IN THE LAST TWO WEEKS DID YOU CONSULT THE (Specify third OHP from Q23 and Q24)?

Number _____

I WANT TO TALK TO YOU ABOUT (THIS/YOUR MOST RECENT) CONSULTATION.

32. WHAT MEDICAL CONDITIONS DID YOU HAVE WHICH CAUSED YOU TO CONSULT THE (Specify third OHP from Q23 and Q24)?

Interviewer: Prompt for condition if a treatment or symptom is reported.

1 _____

2 _____

3 _____

DENTAL HEALTH

33. DO YOU HAVE ANY OF YOUR OWN NATURAL TEETH?

Yes
No

34. DO YOU HAVE ANY DENTURES OR FALSE TEETH WHICH CAN BE REMOVED?

Yes
No - Go to question 37

35. ARE THESE IN ....

Both your jaws
Your upper jaw only - Go to Q35
Your lower jaw only - Go to Q36

36. IN YOUR UPPER JAW IS THIS A FULL OR PARTIAL SET?

Full
Partial

37 Sequence Guide
If upper jaw only (code 2 in Q35 →Q39
Otherwise →Q38

38. IN YOUR LOWER JAW IS THIS A FULL OR PARTIAL SET?

Full
Partial

39. IN THE LAST TWO WEEKS, HAVE YOU CONSULTED A DENTIST OR ANYONE ABOUT YOUR TEETH, DENTURES OR GUMS?

Yes
No

40. HOW MANY CONSULTATION HAVE YOU HAD IN THE LAST TWO WEEKS?

Number _____

41. AT (THAT/THE LAST) CONSULTATION, DID YOU HAVE:

Any teeth taken out?
An X-ray?
Your teeth or dentures cleaned or polished?
Fluoride treatment or coating?
Any fillings?

What other treatment, if any, did you have?

Dentures - preparation, filling
Dentures - maintenance, repair
Braces/bands - fitting, maintenance
Check up
Other
No treatment

42. WHEN WAS THE LAST TIME YOU CONSULTED A DENTIST OR ANYONE ABOUT YOUR TEETH, DENTURES OR GUMS?

Less than 3 months ago
3 months to less than 6 months ago
6 months to less than 12 months ago
12 months to less than 2 years ago
2 years ago or more
Never
Don't know

If discharged from hospital in the last two weeks (code 1 in Q7) go to Q41
Otherwise go to Q52

43. Sequence Guide
If discharged from hospital in th elast two weeks (code 1 inQ7) →Q44
Otherwise →Q57

FOR THOSE DISCHARGED FROM HOSPITAL IN THE LAST TWO WEEKS

DAYS OFF

44. IN THE LAST TWO WEEKS HAVE YOU STAYED AWAY FROM YOUR JOB (SCHOOL/COLLEGE OR UNIVERSITY) BECAUSE OF ANY ILLNESS OR INJURY?

Yes
No - Go to Q45

45. WHAT WAS THE ILLNESS OR INJURY?

Interviewer: Prompt for condition if a treatment or symptom is reported.

1 _____

2 _____

3 _____

46. HOW MANY DAYS IN THE LAST TWO WEEKS DID YOU STAY AWAY FROM WORK (SCHOOL/ COLLEGE OR UNIVERSITY)?

Number _____

47. HOW MANY OF THESE DAYS WERE SPENT IN HOSPITAL?

None
Number _____

REDUCED ACTIVITY

48. (ON ANY OTHER DAYS) IN THE LAST TWO WEEKS, HAVE YOU HAD TO CUT DOWN ON ANYTHING YOU USUALLY DO BECAUSE OF ILLNESS OR INJURY (APART FROM WHEN YOU WERE IN HOSPITAL AND AWAY FROM WORK, SCHOOL, COLLEGE OR UNIVERSITY?

Yes
No - Go to Q50

49. WHAT WAS THE ILLNESS OR INJURY?

Interviewer: Prompt for condition if a treatment or symptom is reported.

1 _____

2 _____

3 _____

50. HOW MANY DAYS IN THE LAST TWO WEEKS DID YOU CUT DOWN, NOT COUNTING DAYS IN HOSPITAL

Number _____

If days away (code 1 in Q43) go to Q48
Otherwise to go Q50

51. Sequence Guide
If days away (code 1 in Q44 →Q52
Otherwise →Q54

DAYS IN BED

52. ON ANY OF THOSE DAYS IN THE LAST TWO WEEKS YOU STAYED AWAY FROM WORK, SCHOOL/COLLEGE OR UNIVERSITY, DID YOU STAY IN BED FOR ALL OR MOST OF THE DAY?

Yes
No - Go to Q50

53. HOW MANY DAYS DID YOU STAY IN BED, NOT COUNTING DAYS IN HOSPITAL?

None
Number _____

54. Sequence Guide

If reduced activity (code 1 in Q47) go to Q50
Otherwise go to Q62

55. ON ANY OF THOSE DAYS IN THE LAST TWO WEEKS THAT YOU CUT DOWN ON YOUR ACTIVITIES, DID YOU STAY IN BED FOR ALL OR MOST OF THE DAY?

Yes
No - Go to Q68

56. HOW MANY DAYS DID YOU STAY IN BED, NOT COUNTING DAYS IN HOSPITAL?

Number _____

Interviewer: For those discharged from hospital in the last two weeks skip to Q55

FOR THOSE WHO WERE NOT DISCHARGED FROM HOSPITAL IN THE LAST TWO WEEKS

DAYS OFF

57. IN THE LAST TWO WEEKS HAVE YOU STAYED AWAY FROM YOUR JOB, SCHOOL/COLLEGE, OR UNIVERSITY FOR ALL OR MOST OF THE DAY BECAUSE OF ANY ILLNESS OR INJURY?

Yes
No - Go to Q55

58. WHAT WAS THE ILLNESS OR INJURY?

Interviewer: Prompt for condition if a treatment or symptom is reported.

1 _____

2 _____

59. ON HOW MANY DAYS IN THE LAST TWO WEEKS DID YOU STAY AWAY FROM WORK, SCHOOL/COLLEGE, OR UNIVERSITY?

Number _____

REDUCED ACTIVITY

60. ON ANY DAYS IN THE LAST TWO WEEKS (APART FROM WHEN YOU WERE AWAY FROM WORK, SCHOOL/COLLEGE, OR UNIVERSITY) HAVE YOU HAD TO CUT DOWN ON ANYTHING YOU USUALLY DO BECAUSE OF ILLNESS OR INJURY?

Yes
No

61. WHAT WAS THE ILLNESS OR INJURY?

Interviewer: Prompt for condition if a treatment or symptom is reported.

1 _____

2 _____

3 _____

62. HOW MANY DAYS IN THE LAST TWO WEEKS DID YOU CUT DOWN?

Number _____

63. Sequence Guide
If days away (code 1 in Q57) go to Q68
Otherwise go to Q62

DAYS IN BED

64. ON ANY OF THOSE DAYS IN THE LAST TWO REEKS YOU STAYED AWAY FROM WORK, SCHOOL/ COLLEGE OR UNIVERSITY, DID YOU STAY IN BED FOR ALL OR MOST OF THE DAY?

Yes
No

65. HOW MANY DAYS DID YOU STAY IN BED?

Number _____

66. Sequence Guide

If reduced activity (code 1 in Q60) go to Q60
Otherwise go to Q62

67. ON ANY OF THOSE DAYS IN THE LAST TWO WEEKS YOU CUT DOWN ON YOUR ACTIVITIES, DID YOU STAY IN BED FOR ALL OR MOST OF THE DAY?

Yes
No - Go to Q62

68. HOW MANY DAYS DID YOU STAY IN BED?

Number _____

VITAMINS/MINERALS

69. IN THE LAST TWO WEEKS, HAVE YOU TAKEN ANY VITAMINS OR MINERAL SUPPLEMENTS?

Yes
No - Go to Q75

70. DID YOU TAKE MORE THAN ONE KIND OF VITAMIN OR MINERAL?

Yes
No
Multivitamins only

71. WERE ANY OF THESE PRESCRIBED OR ADVISED BY A DOCTOR?

Yes - all
Yes - some
No - none

72. DID YOU TAKE THESE VITAMINS OR MINERALS BECAUSE YOU HAD A MEDICAL CONDITION AT THE TIME?

Yes
No - Go to Q67

73. WHAT WAS THE MEDICAL CONDITION WHICH CAUSED THIS?

Interviewer: Prompt for condition if a treatment or symptom is reported.

1 _____

2 _____

3 _____

74. HOW OFTEN DO YOU USUALLY TAKE VITAMINS OR MINERALS?

Every day and/or night (6-7 days/nights per week)
Most days and/or nights (4-5 days/nights per week
1-3 days and/or nights a week
Less than once a week.

75A.IN THE LAST TWO WEEKS, HAVE YOU TAKEN ANY:	COUGH MEDICINES, OR ANY OTHER REMEDIES FOR COLDS?	69. MEDICATIONS FOR AN ALLERGY?	70. SKIN OINTMENTS OR CREAMS SUCH AS HEAT RUBS, ANTISEPTIC CREAMS OR CREAMS FOR RASHES?	71. MEDICATIONS FOR YOUR STOMACH, OR ANY LAXATIVES?	72. FLUID TABLETS OR MEDICATIONS FOR HEART PROBLEMS OR BLOOD PRESSURE?
Interviewer: Read across the list an record all responses	Q76 Yes	Q80 Yes	Q84 Yes	Q88 Yes	Q92 Yes
	No	No	No	No	No
75B. DID YOU USE MORE THAN ONE BRAND, OR KIND OR (specify medication)	Q77 Yes	Q81 Yes	Q85 Yes	Q89 Yes	Q93 Yes
	No	No	No	No	No
75C. WERE ALL, SOME OR NONE OF THESE PRESCRIBED OR ADVISED BY A DOCTOR?	Q87 Yes/all Yes/some No/none	Q82 Yes/all Yes/some No/none	Q86 Yes/all Yes/some No/none	Q90 Yes/all Yes/some No/none	Q94 Yes/all Yes/some No/none
75D. WHAT WAS THE MEDICAL CONDITION?	Q79	Q83	Q87	Q91	Q95
Interviewer: Prompt for condition if symptom or treatment is reported					

SLEEPING PILLS

96. IN THE LAST TWO WEEKS HAVE YOU TAKEN OR USED ANY PILLS OR MEDICATIONS TO HELP YOU SLEEP?

Yes
No - Go to Q79

97. DID YOU USE MORE THAN ONE BRAND OR KIND OF SLEEPING PILL OR MEDICATION?

Yes
No

98. WERE THESE PRESCRIBED OR ADVISED BY A DOCTOR?

Yes/all
Yes/some
No/none

99. WHAT WAS THE MEDICAL CONDITION YOU USED THESE PILLS OR MEDICATIONS FOR?

Interviewer: Prompt for condition if a treatment or symptom is reported.

1 _____

100. WHAT IS/ARE THE NAME/S OF THE SLEEPING PILLS OR MEDICATION YOU TOOK IN THE LAST TWO WEEKS?

Ducene
Euhypnos
Mogadon
Normison
Serepax
Valium
Other (please specify) _____

_____

101. HOW OFTEN DO YOU USUALLY TAKE SLEEPING PILLS OR MEDICATION?

Every day and/or night
(6-7 days/nights per week)
Most days and/or nights
(4-5 days/nights per week)
1-3 days and/or nights a week
Less than once a week - Go to Q81

102. HOW LONG HAVE YOU TAKEN SLEEPING PILLS OR MEDICATION THIS REGULARLY?

Less than one month
1 month to less than 3 months
3 months to less than 6 months
6 months or more

PAIN RELIEVERS

103. IN THE LAST TWO WEEKS HAVE YOU TAKEN OR USED ANY PAIN RELIEVERS SUCH AS ASPIRIN, CODEINE OR PANADOL?

Yes
No - Go to Q87

104. DID YOU USE MORE THAN ONE BRAND OR KIND OF PAIN RELIEVER?

Yes
No

105.WERE ALL, SOME OR NONE OF THESE PRESCRIBED OR ADVISED BY A DOCTOR?

Yes/all
Yes/some
No/none

106.WHAT WAS THE MEDICAL CONDITION YOU USED THESE MEDICATIONS FOR?

Interviewer: Prompt for condition if a treatment or symptom is reported.

_____

_____

107.WHAT IS/ARE THE NAME/S OF THE PAIN RELIEVER/S YOU TOOK IN THE LAST TWO WEEKS?

Aspirin/aspro
Disprin
Panadine
Panadol
Panamex
Paracetemol
Other (please specify) _____

_____

108.HOW OFTEN DO YOU USUALLY TAKE PAIN RELIEVERS?

Every day and/or night
(6-7 days/nights per week)
Most days and/or nights
(4-5 days/nights per week)
1-3 days and/or nights a week
Less than once a week

109.HOW LONG HAVE YOU TAKEN PAIN RELIEVERS THIS REGULARLY?

Less than one month
1 month to less than 3 months
3 months to less than 6 months
6 months or more

110.IN THE LAST TWO WEEKS HAVE YOU TAKEN OR USED ANY MEDICATIONS FOR NERVOUS CONDITIONS OR TRANQUILLISERS OR SEDATIVES?

Yes
No - Go to Q93

TRANQUILLISERS/SEDATIVES

111.DID YOU USE MORE THAN ONE BRAND OR KIND OF MEDICATION FOR A NERVOUS CONDITION, TRANQUILLISERS OR SEDATIVE?

Yes
No

112.WERE ALL, SOME OR NONE OF THESE PRESCRIBED BY A DOCTOR?

Yes/all
Yes/some
No/none

113.WHAT WAS THE MEDICAL CONDITION YOU USED THESE MEDICATIONS, TRANQUILLISERS OR SEDATIVES FOR?

Interviewer: Prompt for condition if a treatment or symptom is reported.

114.WHAT IS/ARE THE NAME/S OF THE MEDICATION/S, TRANQUILLISER/S OR SEDATIVE/S YOU TOOK IN THE LAST TWO WEEKS?

Ducene
Euhypnos
Mogadon
Normison
Serepax
Valium
Other (please specify) _____

_____

115.HOW OFTEN DO YOU USUALLY TAKE MEDICATIONS, TRANQUILLISERS OR SEDATIVES?

Every day and/or night
(6-7 days/nights per week)
Most days and/or nights
(4-5 days/nights per week)
1-3 days and/or nights a week
Less than once a week

116.HOW LONG HAVE YOU TAKEN MEDICATIONS, TRANQUILLISERS OR SEDATIVES THIS REGULARLY?

Less than one month
1 month to less than 3 months
3 months to less than 6 months
6 months or more

OTHER MEDICATION

117.IN THE LAST TWO WEEKS HAVE YOU TAKEN OR USED ANY OTHER TYPE OF MEDICATION?

Yes
No - Go to Q99

118.WHAT TYPES OF MEDICATION DO YOU TAKE OR USE?

1. _____
2. _____
3. _____
4. _____

119.WERE ALL, SOME OR NONE OF THESE PRESCRIBED OR ADVISED BY A DOCTOR?

Yes/all
Yes/some
No/none

120.WHAT IS THE MEDICAL CONDITION/S YOU USED THESE MEDICATIONS FOR?

Interviewer: Prompt for condition if a treatment or symptom is reported.

1. _____
2. _____
3. _____
4. _____

OTHER ILLNESSES

121. IN THE LAST TWO WEEKS DID YOU HAVE ANY ILLNESS OR INJURY THAT YOU HAVE NOT ALREADY TOLD ME ABOUT?

PLEASE INCLUDE ANY CONDITION OR AILMENT NO MATTER HOW TRIVIAL IT MAY SEEM

Yes
No

122. WHAT WAS THIS ILLNESS OR INJURY?

Interviewer: Prompt for condition if a treatment or symptom is reported.

LONG TERM CONDITIONS

123.
I NOW HAVE SOME QUESTIONS ABOUT LONG TERM CONDITIONS, THAT IS, CONDITIONS THAT HAVE LASTED, OR ARE LIKELY TO LAST FOR SIX MONTHS OR MORE. (PLEASE INCLUDE ANY CONDITIONS YOU MAY HAVE ALREADY MENTIONED)

Interviewer: If the answer is "Yes" to any of the following ask: WHAT CONDITION DO YOU HAVE? Record the condition/s in the space provided before reading out the next category.

DO YOU HAVE ANY LONG TERM CONDITIONS THAT RECUR FROM TIME TO TIME SUCH AS ASTHMA OR HAYFEVER?

DO YOU HAVE ANY CONDITIONS WHICH YOU HAVE HAD FOR A LONG TIME AND HAVE ADJUSTED TO SUCH AS ARTHRITIS OR BACK PROBLEMS?

DO YOU HAVE ANY CONDITIONS WHICH ARE UNDER CONTROL BECAUSE YOU ARE HAVING LONG TERM TREATMENT OR TAKING MEDICATION? FOR EXAMPLE, NEEDING GLASSES OR HAVING HIGH BLOOD PRESSURE?

Interviewer: Show prompt card 1

DO YOU HAVE ANY OTHER CONDITIONS LIKE THESE?

(PLEASE INCLUDE ANY CONDITIONS YOU MAY HAVE ALREADY MENTIONED)

_____

_____

_____

_____

_____

_____

_____

_____

124. Sequence Guide

If at least one condition recorded go to Q125
Otherwise go to Q157

125. Interviewer: Enter the first 8 (different) conditions recorded on pages 1 to 16. Then complete the first question for each then the next where appropriate.	Condition 1	Condition 2	Condition 3	Condition 4	Condition 5	Condition 6	Condition 7	Condition 8
	129	132	135	138	141	144	147	150
126. Interviewer: Code each condition from the list below	130.	133.	136.	139.	142.	145.	148.	151.
01 Check-up or examination (unspecified)	01	01	01	01	01	01	01	01
02 Common Cold	02							
03 Contraception	03	02	02	02	02	02	02	02
04 Counselling	04	03	03	03	03	03	03	03
05 Hangover	05	04	04	04	04	04	04	04
06 Immunisation	06	05	05	05	05	05	05	05
07 Menstruation	07	06	06	06	06	06	06	06
08 Pregnancy	08	07	07	07	07	07	07	07
09 Test (unspecified)	09	08	08	08	08	08	08	08
10 X-Ray (unspecified)	10	09	09	09	09	09	09	09
11 Prevention	11	10	10	10	10	10	10	10
12 Other	12	11	11	11	11	11	11	11
		12	12	12	12	12	12	12
127. I NOW WANT TO ASK YOU ABOUT THE CAUSE OF THE CONDITION/S YOU HAVE TOLD ME ABOUT Interviewer: Show prompt card 2 WHICH OF THESE BEST DESCRIBES WHAT CAUSED YOUR CONDITION								
1 Accident	131.	134.	137.	140.	143.	146.	149.	152.
2 Working conditions	1	1	1	1	1	1	1	1
3 Other (please specify)	2	2	2	2	2	2	2	2
	3 (specify)	3 (specify)	3 (specify)	3 (specify)	3 (specify)	3 (specify)	3 (specify)	3 (specify)

128. If no accident ticked go to Q157 If only one accident ticked go to Q155 If more than one accident ticked go to Q153

153. YOU SAID THAT CONDITIONS IN Q126 - Q127 WERE CAUSED BY AN ACCIDENT. WERE THESE THE RESULT OF THE SAME ACCIDENT?

Yes - Go to Q155
No

154. WHICH OF THESE CONDITIONS ARE A RESULT OF YOUR MOST RECENT ACCIDENT?

1. _____

2. _____

155. WHEN DID YOUR MOST RECENT ACCIDENT HAPPEN?

Less than 2 weeks ago
2 weeks to less than 4 weeks ago
4 weeks to less than 12 weeks ago
3 months to less than 6 months ago
6 months to less than 12 months ago
1 year or more ago (specify years)

156. DID THIS ACCIDENT HAPPEN ...

At work
At your home or at the home of friends or relatives?
On a street, road or highway?
During sport, exercise or recreational activities?
At a school or other educational institution?
None of these

157. NOW I WAN TO ASK YOU ABOUT SOME SPECIFIC CONDITIONS

158. Sequence Guide

If asthma, bronchitis or emphysema record in Q100 - Q107 go to Q116
Otherwise proceed to next question

159. APART FROM WHEN YOU HAVE HAD COLDS, HAS YOUR CHEST EVERY SOUNDED WHEEZY OR WHISTLY?

Yes
No

160. WHEN DID THIS LAST OCCUR?

Less than one year ago
1 year to less than 3 years ago
3 years to less than 5 years ago
5 years or more

161. HAS YOUR CHEST SOUNDED WHEEZY OR WHISTLY ....

Frequently
Occasionally

If diabetes recorded in Q100 - Q107 go to Q117
Otherwise proceed to next question.

162. HAVE YOU EVER BEEN TOLD BY A DOCTOR OR NURSE THAT YOU HAVE DIABETES?

Yes
No

164. Sequence Guide

If hyperglycaemia or high blood sugar levels recorded in Q100 - Q107 go to Q118
Otherwise proceed to next question

165. HAVE YOU EVER BEEN TOLD BY A DOCTOR OR NURSE THAT YOU HAVE HIGH SUGAR LEVELS IN YOUR BLOOD OR URINE?

Yes
No

166. Sequence Guide

If high blood pressure recorded in Q100 - Q107 go to Q119
Otherwise proceed to next question

167. HAVE YOU EVER BEEN TOLD BY A DOCTOR OR NURSE THAT YOU HAVE HIGH BLOOD PRESSURE?

Yes
No

168. Sequence Guide

If angina recorded in Q100 - Q107 go to Q120
Otherwise proceed to next question

169. HAVE YOU EVER BEEN TOLD BY A DOCTOR OR NURSE THAT YOU HAVE ANGINA?

Yes
No

170. Sequence Guide

If heart attack recorded in Q100 - Q107 go to Q121
Otherwise proceed to next question

171. HAVE YOU EVER BEEN TOLD BY A DOCTOR OR A NURSE THAT YOU HAVE HAD A HEART ATTACK?

Yes
No

172. Sequence Guide

If stroke recorded in Q100 - Q107 go to Q122
Otherwise proceed with next question

173. HAVE YOU EVER BEEN TOLD BY A DOCTOR OR NURSE THAT YOU HAVE HAD A STROKE?

Yes
No

174. Sequence Guide

If high cholesterol recorded in Q100 - Q107 go to Q123
Otherwise proceed with next question

175. HAVE YOU EVER BEEN TOLD BY A DOCTOR OR NURSE THAT YOU HAVE HIGH CHOLESTEROL?

Yes
No

176. Sequence Guide

If high triglycerides recorded in Q100 - Q107 go to Q124
Otherwise proceed with next question

177. HAVE YOU EVER BEEN TOLD BY A DOCTOR OR NURSE THAT YOU HAVE HIGH TRIGLYCERIDES?

Yes
No

HEIGHT/WEIGHT

178. HOW TALL ARE YOU WITHOUT SHOES?

Interviewer: Convert imperial measurements to metric

Centimetres _____

Feet _____ Inches _____

Don't know _____

179. HOW MUCH DO YOU WEIGH WITHOUT CLOTHES AND SHOES?

Interviewer: Convert imperial measurements to metric

Kilograms _____

Stone _____ Pounds _____

Don't know _____

TOBACCO

I WOULD LIKE TO ASK YOU SOME QUESTIONS ABOUT SMOKING

180. DO YOU CURRENTLY SMOKE?

Yes
No - Go to Q189

181. DO YOU SMOKE ....

Cigarettes?
Cigars?
A pipe?

182. HOW OLD WERE YOU WHEN YOU STARTED SMOKING REGULARLY?

Age _____

183. Sequence Guide

If a cigarette smoker proceed to next question
Otherwise go to Q137

184. DO YOU USUALLY SMOKE ...

Packet cigarettes
Roll your own cigarettes (go to Q143)

185. HOW MANY CIGARETTES DO YOU USUALLY SMOKE A DAY?

Number _____

186. HAVE YOU EVER TRIED TO GIVE UP SMOKING CIGARETTES?

Yes
No

187. WHAT IS THE TAR CONTENT OF YOUR CIGARETTES?

Interviewer: Tell the respondent the tar content can usually be found on the cigarette packet

Milligrams _____
Don't know

188. WHAT IS THE NICOTINE CONTENT OF YOUR CIGARETTES?

Interviewer: Tell the respondent the nicotine content can usually be found on the cigarette packet

Milligrams _____
Don't know

For those who are current smokers go to Q143

EX-SMOKERS

189. HAVE YOU EVER SMOKE REGULARLY?

Yes
No - go to Q143

190. HOW OLD WERE YOU WHEN YOU STARTED SMOKING REGULARLY?

Age _____

191. DID YOU SMOKE ....

Cigarettes?
Cigars?
A pipe?

192. Sequence Guide

If a cigarette smoker go to Q137
Otherwise go to Q143

193. HAVE YOU EVER SMOKE CIGARETTES REGULARLY?

Yes
No - go to Q143

194. DID YOU USUALLY SMOKE ...

Packet cigarettes?
Roll-your own cigarettes?

195. HOW MANY CIGARETTES DID YOU USUALLY SMOKE A DAY?

Number _____

196. HOW OLD WERE YOU WHEN YOU LAST GAVE UP CIGARETTES?

Age _____

197. WHY DID YOU GIVE UP CIGARETTES?

Advice of family/friends/doctor

Interviewer: Ask WHY DID THAT PERSON ADVISE YOU TO GIVE UP?

Health

Interviewer: Ask - WHAT PARTICULAR ASPECT OF HEALTH DO YOU MEAN?

Smoking harmful to health/cancer/ heart disease
Cough/sore throat
Reduces fitness/restricts activity
Other health reasons eg.
Operations, pregnancy
Offensive to others
Expense
Lost interest/didn't feel like it anymore
Other reasons

198. Sequence Guide
If two or more reasons circled in Q141 proceed to next question
Otherwise go to Q143

199. WHICH WAS THE MAIN REASON FOR GIVING UP CIGARETTES?

_____

ALCOHOL CONSUMPTION

200. THE NEXT FEW QUESTIONS ARE ABOUT ALCOHOLIC DRINKS

HAVE YOU HAD ANY DRINKS AT ALL THAT CONTAIN ALCOHOL IN THE LAST SEVEN DAYS?

Yes - Go to Q145
No

201. HOW LONG AGO DID YOU LAST HAVE AN ALCOHOLIC DRINK?

More than one week to less than 1 month ago
1 month to less than 3 months ago
3 months to less than 12 months ago
12 months or more ago
Never

202. Sequence Guide

For non-drinkers go to Q149

202. Interviewer: tick the day on which the interview was conducted.

Monday
Tuesday
Wednesday
Thursday
Friday
Saturday
Sunday

Q203. DID YOU HAVE ANY DRINKS THAT CONTAINED ALCOHOL ON (specify each day of the week, staring from yesterday)?

Q204. Interviewer: For each day on which respondent drank ask both questions below

WHAT KIND OF DRINKS (specify day) DID YOU HAVE?

HOW MUCH (specify drink) DID YOU HAVE ON (specify day)?

		Beer	
	Extra/special light	Low alcohol	Full strength
A. Sunday			
Yes			
No			
B. Monday			
Yes			
No			
C. Tuesday			
Yes			
No			
D. Wednesday			
Yes			
No			
E. Thursday			
Yes			
No			
F. Friday			
Yes			
No			
G. Saturday			
Yes			
No			
Office Use Only	205.	206.	207

Beer glasses
Best: 10 oz, 285 ml etc
Second best: pony, middy, schooner etc
Last resort: small (7oz or less) sg
Medium (8-11oz) mg
Large (12 oz or more) lg

Wine glasses/fortified wine glasses
Small (3oz or less) sg
Medium (4oz) mg
Large (5oz or more) lg

All bottles and cans: b/c
Small (10oz/285ml) twist tops sb/ac
Medium (13oz/370ml) stubbie, normal can: mb/mc
Large (26oz/740ml) bottle of wine, beer or spirits; lb/lc
Flagon: f
Other: specify size

Spirits: 1nip = 1 oz
Half nip: hn
Double nip: dn

Other
Specify type of drink and quantity as accurately as possible.

	WINE	SPIRITS	FORTIFIED WINE	OTHER	TOTAL (OFFICE USE ONLY)
A. Sunday					212.
Yes					
No					
B. Saturday					213.
Yes					
No					
C. Friday					214.
Yes					
No					
D. Thursday					215.
Yes					
No					
E. Wednesday					216.
Yes					
No					
F. Tuesday					217.
Yes					
No					
G. Monday					218.
Yes					
No					
Office Use Only	208.	209.	210.	211.	

219. IS THE AMOUNT YOU DRANK LAST WEEK ....

More than usual?
Less than usual?
About the same?

EXERCISE

220. I NOW WANT TO ASK YOU ABOUT EXERCISE YOU MAY DO FOR SPORT, RECREATION OR FITNESS.

IN THE LAST TWO WEEKS DID YOU DO ANY WALKING FOR EXERCISE OR RECREATION?

Yes
No - go to Q 152

221. HOW MANY TIMES DID YOU WALK IN THE LAST TWO WEEKS?

Number _____

222. WHAT WAS THE TOTAL AMOUNT OF TIME YOU SPENT WALKING IN THE LAST TWO WEEKS?

Hours _____

Minutes _____

223. I WILL NOW ASK YOU ABOUT MODERATE EXERCISE AND VIGOROUS EXERCISE APART FROM WALKING

. IN THE LAST TWO WEEKS DID YOU DO ANY EXERCISE WHICH CAUSED A MODERATE INCREASE IN YOUR HEART RATE OR BREATHING?

Yes
No - go to Q226

224. HOW MANY TIME DID YOU DO ANY MODERATE EXERCISE IN THE LAST TWO WEEKS?

Number _____

225. WHAT WAS THE TOTAL AMOUNT OF TIME YOU SPENT DOING MODERATE EXERCISE IN THE LAST TWO WEEKS?

Hours_____

Minutes _____

226. IN THE LAST TWO WEEKS DID YOU DO ANY EXERCISE WHICH CAUSED A LARGE INCREASE IN YOUR HEART RATE OR BREATHING - IE VIGOROUS EXERCISE?

Yes
No - go to Q229

227. HOW MANY TIMES DID YOU DO ANY VIGOROUS EXERCISE IN THE LAST TWO WEEKS?

Number _____

228. WHAT WAS THE TOTAL AMOUNT OF TIME YOU SPENT DOING VIGOROUS EXERCISE IN THE LAST TWO WEEKS?

Hours_____

Minutes _____

BACKGROUND INFORMATION

NOW I WOULD LIKE TO ASK YOU SOME BACKGROUND QUESTIONS

229. AT HOME DO YOU USUALLY SPEAK A LANGUAGE OTHER THAN ENGLISH?

Yes
No - Go to Q160

230. WHAT LANGUAGE IS THAT?

Dutch
German
Greek
Italian
Serbian/Croatian
Other (please specify)

231. AT WHAT AGE DID YOU LEAVE SCHOOL?

Never went to school
Under 14 years
14 years
15 years
16 years
17 years
18 years or more

232. SINCE LEAVING SCHOOL HAVE YOU OBTAINED A TRADE QUALIFICATION, CERTIFICATE, DIPLOMA, DEGREE OR ANY OTHER QUALIFICATION?

Yes
No - Go to Q 163

233. Interviewer: Show prompt card 3
WHICH OF THESE GROUPS BEST DESCRIBES THE HIGHEST QUALIFICATION YOU HAVE OBTAINED?

Bachelor degree or higher
Trade/apprenticeship
Certificate/diploma
Other

234. ARE YOU CURRENTLY TAKING ANY COURSE OF STUDY AT A TECHNICAL COLLEGE, COLLEGE OF ADVANCED EDUCATION, UNIVERSITY OR OTHER EDUCATIONAL INSTITUTION?

Yes
No - Go to Q 236

235. ARE YOU STUDYING FULL TIME OR PART TIME?

Full-time
Part-time
Correspondence

236. DO YOU CURRENTLY WORK IN ANY JOB, BUSINESS OR FARM?

Yes
No - go to Q
Permanently unable to work - go to Q173

237. DO YOU CURRENTLY HAVE MORE THAN ONE JOB?

Yes
No

I WOULD LIKE TO ASK YOU ABOUT YOUR MAIN JOB, THAT IS, THE JOB IN WHICH YOU USUALLY WORK THE MOST HOURS

238. WHAT KIND OF WORK DO YOU DO?

_____

_____

_____

239. DO YOU WORK ....

For an employer for wages or salary
In your own business with employees
In your own business with no employees other than self
Without pay in a family business

WHAT ARE YOUR WORKING ARRANGEMENTS?

Payment in kind
Unpaid voluntary work

240. WHAT KIND OF INDUSTRY, BUSINESS OR SERVICE IS CARRIED OUT WHERE YOU WORK?

_____

_____

_____

241. INCLUDING ANY PAID OR UNPAID OVERTIME, HOW MANY HOURS A WEEK DO YOU USUALLY WORK (in your main job)?

Hours _____

242. AT ANY TIME DURING THE LAST 4 WEEKS HAVE YOU BEEN LOOKING FOR FULL-TIME WORK?

Yes - Go to Q173
No

243. HAVE YOU BEEN LOOKING FOR PART-TIME WORK AT ANY TIME DURING THE LAST 4 WEEKS?

Yes
No

I AM NOW GOING TO ASK YOU ABOUT VARIOUS SOURCES OF INCOME

244. DO YOU CURRENTLY RECEIVE INCOME FROM:

Wages or salary
Own business or share in partnership
Any government pension or cash benefit including family allowance
Superannuation
Investment/interest
Any other source
None or the above

245. WHAT IS YOUR USUAL INCOME FROM ALL SOURCES BEFORE TAX OR ANYTHING ELSE IS TAKEN OUT (IE GROSS ANNUAL INCOME)

Amount _____

Nil/negative_____

Pay period in weeks _____

246. Sequence Guide

If more than one answer circled in Q244 proceed to next question
Otherwise go to Q248

247. WHAT IS YOUR MAIN SOURCE OF INCOME?

Wages or salary
Own business or share in partnership
Any government pension or cash benefit
Superannuation
Investment/interest
Other

248. Sequence Guide

If code is Pension or cash benefit in Q244 proceed to next question
Otherwise go to Q250

249. Interviewer: Show prompt card 4

DO YOU RECEIVE ONE OF THESE PENSIONS OR BENEFITS?

Age pension
Service pension
Invalid pension
Care's pension
Supporting parent's benefit
Sheltered employment allowance/ Rehabilitation allowance
Sickness benefit
Unemployment benefit
Special benefit
None of these

250. DO YOU RECEIVE ANY OF THESE?

Family allowance/child endowment
Disability pension
Domiciliary nursing care benefit
Handicapped child's allowance
Other
None of these

THE NEXT FEW QUESTIONS ARE ABOUT YOUR PRIVATE HEALTH INSURANCE ARRANGEMENTS

251. APART FROM MEDICARE, ARE YOU CURRENTLY COVERED BY PRIVATE HEALTH INSURANCE?

Yes
No

252. ARE YOU COVERED BY INSURANCE AT SINGLE OR FAMILY RATES?

Single
Family

253. DOES YOUR PRIVATE HEALTH INSURANCE COVER YOU FOR HOSPITAL EXPENSES?

Yes
No - Go to Q182
Don't know

254. DOES YOUR PRIVATE HEALTH INSURANCE COVER ANY EXPENSES APART FROM HOSPITAL EXPENSES?

Yes
No
Don't know

255. DO YOU HAVE A DEPARTMENT OF VETERAN'S AFFAIRS TREATMENT ENTITLEMENT CARD?

Yes
No
Don't know

256. ARE YOU COVERED BY ANY OF THESE OTHER GOVERNMENT HEALTH CONCESSION CARDS?

Pensioner health benefits card
Health benefits card
Health care card
Pharmaceutical benefits concession card
Pharmaceutical benefits entitlement card (chemist card)
Other
Don't know
Not covered

APPENDIX 2.4 - CALCULATION OF COST OF SELF-REPORTED HEALTHCARE CONSUMPTION

For the cost of healthcare consumption variable, we calculated a Dollar value for the services used by introducing a unit cost to each of the items used. Unit costs used were published average costs or prices for the year 1991/92 when the interviews were completed.

The variables constructed and cost weighting applied were:

Hospital bed-day	$542.2
Allied health visit	$28.88
Prescription	$14.40
Hospital outpatient	$19.60
Doctor visit	$36.33
Dental visit	$37.50
Vitamin prescription	$14.40

Information was obtained from Australian Institute of Health and Welfare (Mark Cooper-Stanbury, Michael Cook); Department of Veterans' Affairs (Schedule of Fees for DVA Providers) Pharmaceutical Benefits Department of Human Services and Health (Andrew Mitchell); and the following references.

APPENDIX REFERENCES

Cooper-Stanbury, M., Solon, R., & Cook, M. (1994) Hospital utilisation and costs study 1991-92. Volume 1, A survey of public hospitals and related data. Canberra: Australian Institute of Health and Welfare, AGPS.

Australian Institute of Health and Welfare (1992). Australia's health 1993: the third biennial report of the Australian Institute of Health and Welfare. Canberra: AGPS.

Commonwealth Department of Community Services and Health (1990). Medicare Benefits Schedule Book Effective - 1 May 1990. Canberra: Australian Government Publishing Service.

APPENDIX 2.5 - COMPARISON OF LINEAR REGRESSION AND POISSON REGRESSION

NOTES FROM PRESENTATION TO NCEPH SEMINAR NOV 1997

Background

The Subjects examined in this thesis research were 641 Vietnam veterans interviewed from a random sample of 1000 veterans in the course of the Vietnam Veterans Health Study. Of the 1000 subjects sampled, 213 could not be found, 50 were known to have died, 61 refused interview, and 35 were unable to be interviewed in the time available (O'Toole et al., 1996a). This gives a response rate of 67% based on a sample of 950 living veterans or 91% of the living veterans who could be located.

Factors

Factors considered for the model were selected from 300 variables. 74 were found to be relevant to hypotheses and 37 selected as free from major collinearity with other variables. They were grouped in 7 blocks of related variables:
Age
Physical health
Mental health
Predisposition
Deployment
Repatriation
Exservice organization

DEPENDENT VARIABLE

In the course of the thesis research, both self-report total healthcare consumption for two weeks (Chap3, 4) and actual medical service consumption over a twelve-month period (Chapter 5) were used as dependent variables. In both cases the distribution of the consumption variable was skewed with a long tail to the right (Figures 1a and 1b). In examining the validity of self-report, actual medical care consumption costs for two weeks was compared with self-report for the same period. These data were more skewed than the two main endpoint variables. To examine the validity of using alternate regression models a similarly skewed variable was constructed from fours years of HIC medical care utilisation data that had been collected on the subjects. That is the dependent variable that was used in this seminar presentation. (Figure 1).

HIC and DVA Medical Benefits Paid match extraction for four years around interview period so that total medical services used were identified.

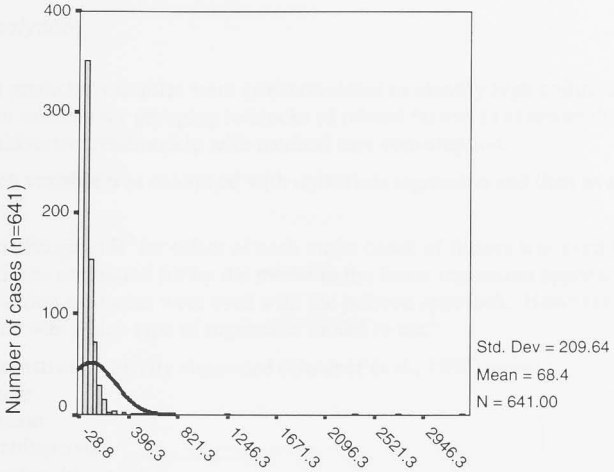

Figure 1a Graph of distribution self reported healthcare consumption cost over two weeks

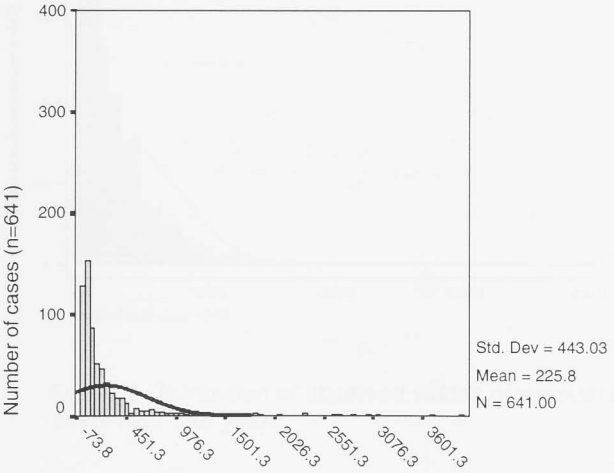

Figure 1b Graph of distribution of actual medical care consumption cost over twelve months

Analyses

All predictor variables were crosscorrelated to identify high collinearity. Variables were then selected for grouping to blocks of related factors to examine their univariate and multivariate relationship with medical care consumption.

Each variable was examined with univariate regression and then as a model with all fitted.

The change in R^2 for effect of each major block of factors was used to measure the variance accounted for by the model in the linear regression approach. 'Deviance' reduction estimates were used with the poisson approach. However, the decision to be made was which type of regression model to use?

Alternatives typically suggested (Gardner et al., 1995) were:
Linear
Poisson
Overdispersed
Negative binomial

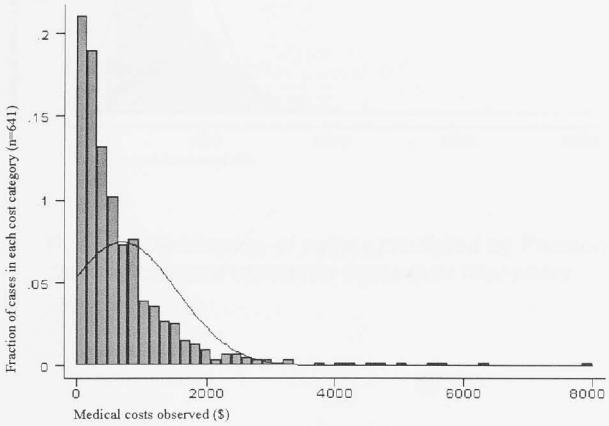

Figure 1 Distribution of observed values of medical care utilisation costs over four years

When these models were applied to the data, the predicted values produced by the models were such that the Poisson distribution most closely matched the observed values. (Figures 1, 2 & 3). The Poisson estimates which follow were made without the overdispersed adjustment applied.

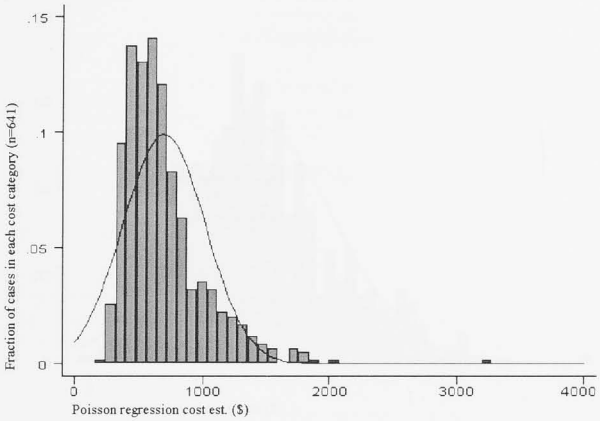

Figure 2 Distribution of values predicted by Poisson regression model for medical care utilisation costs over four years

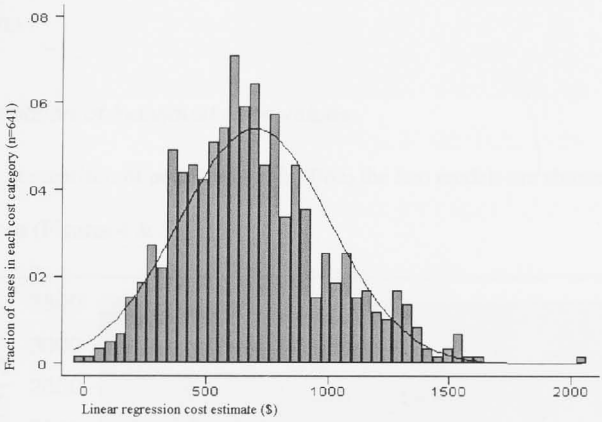

Figure 3 Distribution of values predicted by linear regression model for medical care utilisation costs over four years

Seen together, it appears that the Poisson regression model produces a better estimate of the observed values than the linear regression model. Predicting (only) one negative value also compromised the linear regression model. However, it retained the utility of producing more easily interpretable coefficients in the same units as the dependent variable. (dollar values per unit of predictor variable).

To examine these issues more closely, the values predicted by the models were compared at the individual case level.

IS POISSON REGRESSION A BETTER PREDICTOR OF COST AT THE INDIVIDUAL CASE LEVEL?

Prediction of individual case values

The comparison of predicted values from the two models are shown by the following graphs (Figures 4 & 5)

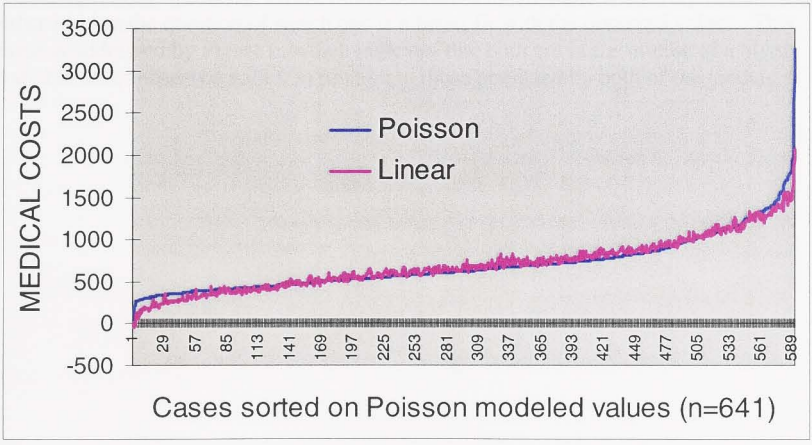

Figure 4 Comparison of linear with Poisson regression modeled values

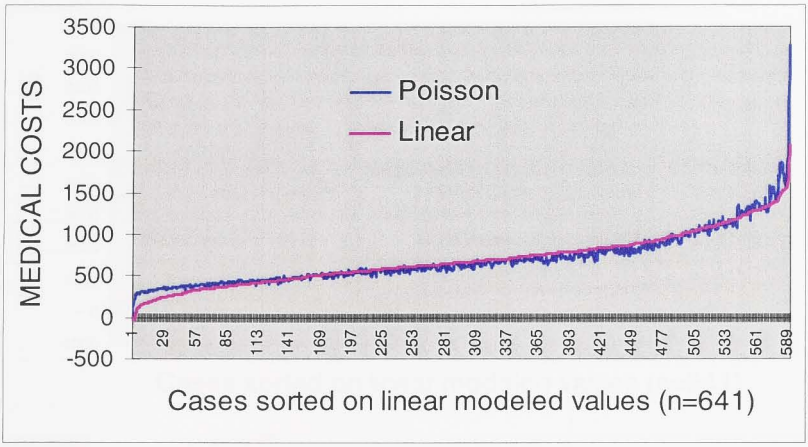

Figure 5 Comparison of Poisson with linear regression modeled values

These figures show that the actual values predicted by the models are very close to each other leaving the question of which one is a better fit with the observed values. This issue is addressed by Figure 6, which indicates that both are in the middle of a highly variable set of observed values in relation to those predicted by both of the models.

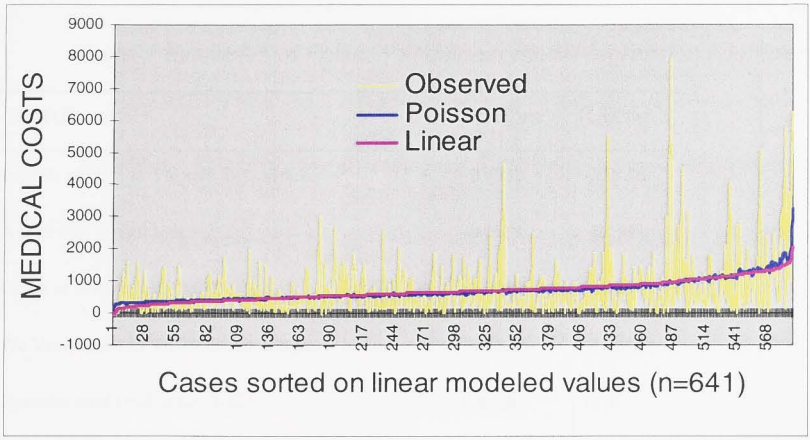

Figure 6 Comparison of observed values with those modeled by Poisson and linear regression

COMPARING COEFFICIENTS

Of further interest was the question of how similar a result was produced by the two models. To examine this question the coefficients and findings on which variables were found to be significant predictors of medical care consumption under the two models were compared. Without the overdispersed adjustment, the Poisson result found many more of the variables significantly related ($p<0.05$) to medical care consumption. This adjustment recognises the level of dispersion from the expected distribution. However, the linear model provided a more conservative result in only finding four of the sample variable significantly related while the Poisson model without the overdispersion adjustment found 9 of the 10 sample variables related. When the overdispersion adjustment was applied the Poisson model identified the same factors as significant predictors as the linear model.

It was also of interest to note that the values of the Poisson coefficients and the linear coefficients were highly correlated (Table 1 & Figure 7).

Table 1 Examples of Poisson and linear model regression coefficients

FACTOR	PoissCoef.	LinCoef.
Pre Vn: attitude to Vn, self (0-1, max.)	**-0.3982**	-258.36
Age at start of first tour	**-0.0951**	**-65.59**
Count of lifetime alc. Sx	**-0.0218**	-10.67
Pre Vn: attitude to Vn, others (0-3, max	-0.0029	-13.55
Spannier total DAS scale (0-32)	**0.0120**	8.78
Lifetime dx of alc.dep/ab.	**0.0381**	20.44
Time in army prior to Vietnam service	**0.0383**	**35.14**
Traveled with unit/went as a reo to Vietnam	**0.0571**	33.14
# Veteran low risk diagnoses	**0.1521**	**118.63**
Abs89 age group	**0.3860**	**259.23**

As mentioned earlier (page 241), the above Poisson analyses were performed without the overdispersion adjustment. When the overdispersion adjustment was applied no difference was observed in the accuracy of distribution predicted by the Poisson model relative to the linear model (only the significance values for the coefficients). It was therefore decided to opt for use of the linear model for this research because of the slight advantage of being able to report results in $ terms.

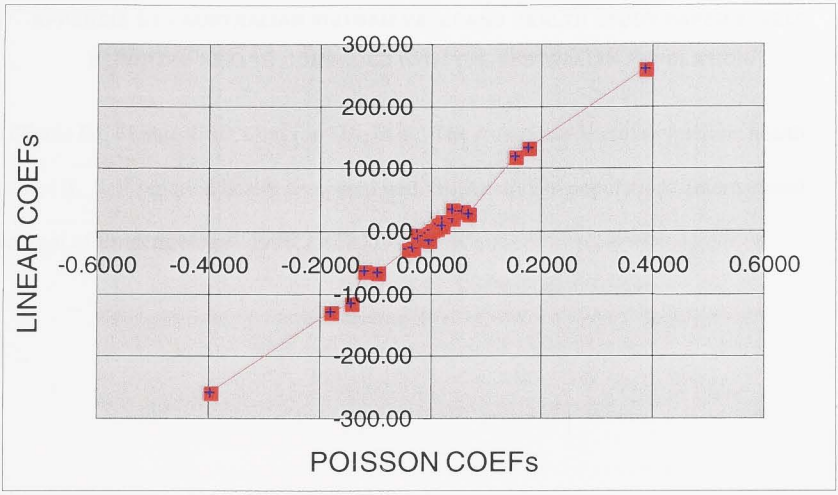

Figure 7 Comparison of Poisson and linear model regression coefficients

IN SUMMARY

It seems that with these data (possibly because of the 'noise' in the relationships that none of the models adequately predict) there is little to gain in using Poisson for these particular data/questions. Both the coefficients produced and the values predicted for the dependent variable appear closely related from the two models. The variance estimates delivered by the regression models were also very similar (18%, 13%).

Linear regression seems **more** discriminating in terms of rejecting the more marginal predictors as not significant. This is particularly so where the Poisson model is allowed to assume a scale parameter of 1 although this can be adjusted using an overdispersed parameter.

Because the linear model is conceptually more easily explained and produces coefficient values that can be interpreted as dollar values, it was decided to report the analyses using this tool. This would not necessarily be justified in those circumstances where Poisson regression was more precise in predicting case values at the individual case level.

APPENDIX 3.1 - AUSTRALIAN VIETNAM VETERANS HEALTH STUDY PAPER 2: SELF REPORTED HEALTH COMPARED WITH THE AUSTRALIAN POPULATION

O'Toole BI, Marshall RP, Grayson DA, et al. The Australian Vietnam veterans health study: II. Self reported health compared with the Australian population. International Journal of Epidemiology. 1996;25(2):319-330.

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Vol. 25, No. 2
Printed in Great Britain

The Australian Vietnam Veterans Health Study: II. Self-Reported Health of Veterans Compared with the Australian Population

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O'Toole B I (Department of Psychiatry, University of Queensland, Royal Brisbane Hospital, Herston, Queensland 2029, Australia), Marshall R P, Grayson D A, Schureck R J, Dobson M, Ffrench M, Pulvertaft B, Meldrum L, Bolton J and Vennard J. The Australian Vietnam Veterans Health Study: II. Self-reported health of veterans compared with the Australian population. *International Journal of Epidemiology* 1996; **25:** 319–330.

Background. Self-reported physical health status of Australian Vietnam veterans was determined 20–25 years after the war and its relation to combat was investigated.

Method. An epidemiological cohort study of a simple random sample of Army veterans posted to Vietnam between 1964 and 1972 was conducted with personal interviews using the Australian Bureau of Statistics Health Interview Survey questionnaire to compare veterans with the Australian population and a 21-item combat exposure index used to measure the relationship of combat to physical health.

Results. Veterans reported greater health service usage and more recent health actions than population expectations. They also reported excess health problems in almost all recent illness disease categories except endocrine conditions and cardiovascular conditions; only 6 of 37 chronic disease groups were not elevated compared to the population. Adjustment for non-response changed estimates only slightly. Combat exposure was significantly related to reports of recent and chronic mental disorders, recent hernia and chronic ulcer, recent eczema and chronic rash, deafness, chronic infective and parasitic disease, chronic back disorders and symptoms, signs and ill-defined conditions.

Conclusion. Combat exposure may have significantly increased reports of only some health problems. A general disposition to complain as a result of psychological conditions due to combat is not consistent with the lack of relationship between combat and reports of physical conditions.

Keywords: Vietnam veterans, health interviews, combat

Participants in war may experience certain short-term somatic effects soon afterwards,[1] however the question of the fact and extent of long-term physical health effects has received little scientific attention.[2] Studies of prisoners of war (POWs), who have presumably undergone more severe war-related stress have been reported.[3–13] However there have been few large cohort studies performed, although several smaller studies have examined the effects of service in particular locations or under particular conditions.[2] Australian[8–10] and British[10–13] epidemiological studies have compared POWs with other servicemen who were not captured. A recent review[2] concluded that there was evidence for increased rates of peptic ulcer, strongyloidiasis, neurologic conditions (principally hearing loss), and anxiety and depression among former POWs held in Asia compared with military peers.[8–13] Past and present hepatitis infections (A, B) were more prevalent in POWs than non-POWs, however the levels were quite

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high among non-POWs compared with community expectations, possibly arising from the comparison group also having served in South East Asia during World War II.

While these types of studies focus on the direct effects of being a POW, they do not inform about the health effects of participation in war *per se*. To determine these effects requires a design extending beyond special groups such as POWs and ideally incorporating a comparison group who did not go to war. A recent large-scale epidemiological study was conducted by the American Centres for Disease Control[14–16] (CDC) and examined physical and mental health of Vietnam veterans and a comparison group of military personnel who served at the same time but elsewhere than Vietnam. The CDC study found that, compared with men serving elsewhere, Vietnam veterans reported more current and past health problems: limitations to activities, prescribed medication use, somatic symptoms, deafness, hypertension, chloracne and other skin conditions, ulcers, hepatitis, liver conditions, urinary tract problems, and benign growths, although there was no excess cancer. Little of the self-reported excess was substantiated on medical examination of a subsample, although Vietnam veterans had more signs of deafness, a 4% higher mean serum level of thyroid-stimulating hormone and higher prevalence of hepatitis B antibodies. This last finding is consistent with the results among the Australian POWs and non-POWs of WWII who also served in South East Asia.[8–10]

Another recent large-scale epidemiological study of American Vietnam veterans, the National Vietnam Veterans Readjustment Study (NVVRS)[17,18] was directed to psychiatric conditions, particularly post-traumatic stress disorder (PTSD), and only reported a health index based on the number of recent and chronic conditions reported and a limited number of health actions taken in relation to physical and mental health; self-reported prevalence of illness in specified disease categories was not ascertained.

Studies of the role of combat and other stress exposure on physical illness are inconsistent. The CDC study[19] found that all 21 of the physical health outcomes were related to combat intensity, although after adjustment for perceived 'agent orange' exposure the effects became non-significant. The NVVRS[17,18] reported significantly more chronic health problems among a subgroup of men exposed to high war zone stress. A report from the Israeli Army[1] suggests that the lingering effects of traumatic exposure, such as PTSD, are more important to self-reported somatic complaints than combat exposure.

The overall aim of this current study was to determine, by personal interview, the prevalence of self-reported physical and mental illness in a random sample of Australian Vietnam veterans and to examine the relative contributions of pre-enlistment characteristics, war experiences and post-war experiences to that illness. This paper reports the raw and adjusted prevalences of health conditions and compares these with Australian population estimates using the Australian Bureau of Statistics Health Interview.[20] The issue of response bias is addressed through a regression-based adjustment and the association of morbidity with combat exposure is explored.

METHODS

The study design is described elsewhere.[21] Self-reported health of 641 Australian Vietnam veterans was ascertained using the questionnaire used by the Australian Bureau of Statistics (ABS) Health Interview Survey 1989–1990.[20] The ABS survey selected an area probability sample of 30 000 households and used trained ABS interviewers and standardized survey procedures to derive national population estimates of morbidity. Using closely similar survey methods (except sampling) gave the advantage of comparison with the Australian population morbidity estimates and enabled calculation of relative risks for illness categories. Two slight modifications to the questionnaire were undertaken: the demographic section was relocated to the end of the questionnaire instead of at the beginning (as administered by ABS), and the diet and the women's health sections were omitted. The fieldwork, interviewer and office manuals used by ABS were made available to the study and were modified accordingly. Interviewer training was undertaken by the chief investigators.

The ABS interview began with 4-point Likert items on self-reported health state and self-reported happiness, proceeded to recent health actions and the acute illnesses that had prompted them, then to chronic illnesses, then to the major health risk factors (tobacco, alcohol, exercise), and finally demographic items were asked. Acute illnesses were asked in the context of a 'gate' or sequence question on whether the respondent had taken each specific recent health action: hospitalization in past year, casualty/outpatients attendance in past two weeks, doctor consultation in past two weeks, visits to specified non-medical health practitioners, current medications by category, days off work, days in bed, or days of reduced activity in the past two weeks. These 'gate' questions were followed with questions of frequency of the action and of the medical

TABLE 1 *Distribution of self-reported states of health and happiness of veterans compared with the age-sex matched Australian population. The ratio of proportions is shown 'raw' (i.e. unadjusted for non-response)*

	Vietnam veterans (n = 641) (%)	Australian population expected (%)	Raw RR	99% CI
Perceived health state:				
Excellent	17.1	29.3	0.58	(0.45, 0.71)
Good	50.4	52.5	0.96	(0.86, 1.06)
Fair	24.3	14.3	1.70	(1.39, 2.00)
Poor	8.3	3.8	2.18	(1.45, 2.92)
Perceived happiness:				
Very happy	18.7	24.1	0.78	(0.61, 0.94)
Happy	69.0	70.9	0.97	(0.91, 1.04)
Unhappy	10.3	4.2	2.45	(1.72, 3.19)
Very unhappy	1.7	0.8	2.12	(0.48, 3.77)

conditions (up to three) that caused the action. Chronic conditions were asked by a series of 'open' questions that asked about long-term conditions that had lasted or were likely to last 6 months or more, or that recurred from time to time such as asthma or hay fever, that had been experienced for a long time and been adjusted to, such as arthritis or a bad back, or that were under control because of long-term treatment, such as needing glasses or high blood pressure, and then a checklist of 53 different types of conditions was shown. Interviewers were required to record illness conditions, rather than symptoms, as reasons for health actions. Medical conditions were coded into ICD-9 groupings according to the ABS conditions coding manual. All medical conditions were coded twice, independently, by different coders and the results compared, with discrepancies resolved by the chief investigator.

For comparison with the Australian population, results were age-standardized to the veteran sample. The number of cases among the interviewed veterans and thus the prevalence was computed; the expected number of cases and the prevalence in each category was calculated by standardizing the male Australian population to the age distribution of the veterans; the ratios of the prevalences and their confidence intervals were then computed. Because there were many variables being evaluated, and some of these could be statistically significant by chance, the 99% confidence intervals for the relative prevalences were computed to permit a more stringent criterion for statistical significance of individual estimates. Two estimates from the veteran sample were computed: (1) an observed or 'raw' prevalence ratio, based on the 641 subjects interviewed and the expected prevalence in the corresponding age-standardized Australian population, and (2) a prevalence that was adjusted for the effects of non-response, based on the 950 who were eligible for interview (i.e. not known dead) and the expected prevalence in the corresponding age-adjusted Australian population.

RESULTS

Table 1 shows the self-reported states of health and happiness compared with the age-sex adjusted general population. Veterans, overall, perceived their health state as poorer and themselves as less happy than the Australian population. Interestingly, although they did not include the question on happiness, the CDC study[22] included the same health state question, to which 27.2% responded 'excellent', 56.5% responded 'good', 14.8% responded 'fair' and only 1.5% responded 'poor'. Thus more Australian veterans saw their health as worse than the generally younger veterans studied by CDC. Australian veterans reported an average of 2.34 recent conditions (range 0–11, SD = 85) and 3.79 chronic conditions (range 0–8, SD = 2.22), whereas the corresponding means for the Australian population were 1.42 and 1.75 respectively. In the NVVRS[17,18] the mean number of current chronic health problems reported by their Vietnam veterans was 1.36 (SD = 0.07), although they did not frame their questions or probe in the same way and they did not explicitly include as wide a range of conditions.

Table 2 shows the frequency of each health action taken in the two weeks prior to interview (hospitalization past year), medications taken in the prior two

TABLE 2 *Number of recent health actions taken by veterans and alcohol and smoking status compared to the age-sex standardized Australian population; relative prevalences are shown both unadjusted and adjusted for non-response*

	Vietnam veterans (n = 641) (%)	Australian population raw RR (99% CI)	Response adjusted prevalence (%)	Response adjusted RR (99% CI)
Hospital inpatient	1.4	1.35 (1.01, 1.68)	1.4	1.34 (1.00, 1.67)
Visit casualty/outpatients	4.8	2.36 (1.30, 3.43)	5.6	2.77 (1.61, 3.92)
Doctor consultation	23.3	1.45 (1.18, 1.72)	23.7	1.49 (1.22, 1.77)
Dental consultation	5.8	1.22 (0.72, 1.73)	6.1	1.29 (0.78, 1.81)
Other health professional	15.7	2.04 (1.56, 2.53)	15.9	2.08 (1.60, 2.57)
Days off work	11.3	1.92 (1.37, 2.47)	11.0	1.88 (1.34, 2.42)
Days in bed	6.0	1.16 (0.62, 1.70)	6.5	1.67 (1.03, 2.31)
Days of reduced activity	23.3	3.09 (2.52, 3.66)	23.0	3.08 (2.51, 3.66)
Medications:				
Vitamins, minerals	26.2	1.37 (1.14, 1.61)	24.9	1.31 (1.08, 1.54)
Coughs, colds	14.6	1.66 (1.25, 2.07)	15.8	1.81 (1.39, 2.24)
Skin creams	39.5	2.37 (2.07, 2.67)	38.4	2.31 (2.01, 2.60)
Allergy	7.8	1.46 (0.95, 1.97)	7.9	1.46 (0.95, 1.97)
Stomach, laxatives	15.4	1.99 (1.51, 2.46)	15.4[a]	2.01 (1.53, 2.49)
Cardiovascular	12.6	1.17 (0.86, 1.49)	13.3	1.26 (0.93, 1.59)
Sleeping	9.4	2.44 (1.67, 3.21)	11.0	2.91 (2.07, 3.75)
Pain	50.2	1.56 (1.40, 1.71)	51.3	1.60 (1.44, 1.76)
Tranquillizers	8.7	3.43 (2.30, 4.55)	8.9	3.51 (2.37, 4.66)
Other	19.0	1.24 (0.98, 1.50)	19.0	1.26 (1.00, 1.52)
Smoking:				
Current smoker	26.5	0.86 (0.74, 0.97)	34.8	1.12 (0.97, 1.28)
Former smoker	54.5	1.69 (1.56, 1.82)	40.7	1.26 (1.10, 1.41)
Never smoked	18.1	0.49 (0.40, 0.58)	24.0	0.66 (0.54, 0.77)
Alcohol risk[b]:				
Low	76.5	0.89 (0.85, 0.93)	77.4	0.90 (0.85, 0.95)
Medium	13.2	1.32 (1.04, 1.50)	8.9	1.24 (0.84, 1.65)
High	9.9	1.45 (1.08, 1.81)	13.6	1.99 (1.48, 2.51)

[a] Logistic model contained no independent variables.
[b] Risk groups of Australian Bureau of Statistics.

weeks and smoking and alcohol status. Fewer veterans than the population reported no recent or chronic illness. More veterans reported visiting a hospital casualty or outpatients department, a doctor and other health professionals than the population. More veterans had days off work or days of reduced activity than expected from population estimates. Veterans also consumed most medication groups (except cardiovascular and 'other') at higher rates than the Australian population. Veterans had a higher number of doctor visits and those not visiting the doctor in the prior two weeks had a more recent history of consultation than the population. Similar proportions of veterans were current smokers, but more were former smokers and thus fewer had never smoked. Fewer veterans were in low risk average alcohol intake groups (<50 g of alcohol per day) and more were in moderate and high risk groups (>75 g of alcohol per day). These results were obtained whether raw or response-adjusted comparisons were made; adjustment for non-response changed the prevalences and relative prevalences only slightly, except for smoking and alcohol.

Table 3 shows the prevalence of recent illnesses for which a health action was taken and the relative age-adjusted prevalence compared to the Australian population, both unadjusted and adjusted for non-response. Adjustment was only partially successful, as it was not feasible to obtain adjusted estimates for 14 conditions

TABLE 3 *Prevalence of medical conditions for which recent health actions were taken by Australian Vietnam veterans and their relative prevalences compared with the age-sex standardized Australian population both unadjusted ('raw') and adjusted for response bias*

	Raw prevalence	Raw RR (99% CI)	Response adjusted prevalence	Response adjusted RR (99% CI)
Infective and parasitic disease	6.4	2.44 (1.49, 3.40)	6.5	2.46 (1.51, 3.42)
Neoplasms	4.7	4.48 (2.42, 6.53)	5.0	4.91 (2.74, 7.09)
Endocrine system:				
Cholesterol	3.1	2.95 (1.28, 4.63)	3.1[a]	3.00 (1.30, 4.70)
Diabetes	1.9	1.53 (0.40, 2.66)	1.9[a]	1.57 (0.41, 2.73)
Gout	4.1	1.77 (0.90, 2.65)	3.7	1.65 (0.80, 2.51)
Other endocrine	2.3	1.97 (0.67, 3.26)	2.3[a]	1.98 (0.68, 3.28)
Diseases of blood-forming organs	0.0		0.0[a]	
Mental disorders:				
Nerves, nervousness	7.3	2.78 (1.77, 3.78)	7.3[b]	2.80 (1.79, 3.81)
Depression	3.3	3.57 (1.60, 5.54)	3.3[b]	3.57 (1.60, 5.54)
Other mental illness	3.0	4.92 (2.06, 7.79)	3.0[a]	4.92 (2.06, 7.79)
Sensory/nervous system disorders:				
Disorders of refraction	2.7	2.53 (0.97, 4.09)	2.7[a]	2.54 (0.97, 4.10)
Deafness	0.8	10.00 (0.0, 21.47)	0.8[a]	10.15 (0.0, 21.79)
Migraine	6.9	5.11 (3.20, 7.02)	6.9	5.13 (3.21, 7.04)
Other sensory/nervous	3.6	1.25 (0.59, 1.90)	3.5	1.21 (0.56, 1.85)
Circulatory system:				
Hypertension	8.1	0.93 (0.61, 1.24)	9.4	1.09 (0.75, 1.44)
Heart disease	2.5	1.37 (0.50, 2.24)	2.5[a]	1.42 (0.52, 2.33)
Haemorrhoids	1.4	4.66 (0.69, 8.64)	1.4[a]	4.65 (0.69, 8.61)
Other circulatory system	3.9	1.40 (0.70, 2.11)	3.7	1.35 (0.65, 2.06)
Respiratory system:				
Colds	7.6	1.10 (0.71, 1.49)	7.7	1.11 (0.72, 1.50)
Hay fever	7.3	1.81 (1.16, 2.46)	7.3[a]	1.81 (1.15, 2.46)
Asthma	3.4	1.35 (0.62, 2.08)	3.4	1.36 (0.62, 2.09)
Bronchitis, emphysema	1.2	2.01 (0.19, 3.83)	1.2[a]	2.10 (0.20, 4.00)
Other respiratory	11.2	1.96 (1.40, 2.52)	12.4	2.16 (1.58, 2.75)
Digestive system:				
Ulcer	3.9	2.03 (1.01, 3.06)	3.8	2.02 (0.99, 3.05)
Hernia	1.4	1.68 (0.25, 3.10)	1.4[a]	1.69 (0.25, 3.14)
Other digestive	12.9	1.34 (0.99, 1.69)	12.3	1.28 (0.93, 1.62)
Genito-urinary system	1.2	1.51 (0.14, 2.87)	1.2[a]	1.53 (0.15, 2.91)
Skin:				
Rash	10.3	4.47 (3.13, 5.81)	9.9	4.31 (2.99, 5.62)
Eczema	7.8	1.87 (1.22, 2.53)	8.1	1.96 (1.29, 2.63)
Other skin	9.7	1.82 (1.26, 2.39)	8.9	1.68 (1.14, 2.23)
Musculoskeletal disorders:				
Arthritis	7.3	2.24 (1.43, 3.04)	7.9	2.47 (1.61, 3.33)
Rheumatism	0.2	0.59 (0.0, 2.11)	0.2[a]	0.60 (0.0, 2.14)
Back disorders	11.5	2.07 (1.49, 2.66)	12.0	2.16 (1.56, 2.75)
Other musculoskeletal	10.9	1.69 (1.20, 2.18)	10.9	1.69 (1.20, 2.18)
Disability	0.2	1.79 (0.0, 6.38)	0.2[a]	1.81 (0.0, 6.46)
Injury	8.9	1.49 (1.00, 1.97)	9.1	1.52 (1.03, 2.01)
Symptoms, signs and ill-defined conditions	36.0	1.66 (1.43, 1.88)	36.5	1.67 (1.45, 1.90)

[a] Fewer than 21 cases: adjustment for eligible population age distribution only.
[b] Logistic model contained no independent variables.

which occurred in 20 or fewer veterans (i.e. that were less prevalent than 3.1%). Thus, rarer conditions remain unadjusted for non-response. In addition, for three conditions the logistic model contained no independent variables. Adjustment had little effect on prevalence and relative prevalence estimates. Of 36 conditions groups (there were no blood disorders), 18 had relative prevalences significantly greater than 1.00 and 18 had prevalences with 99% confidence intervals that included 1.00. There were no higher reports of endocrine conditions except high cholesterol, no excess cardiovascular conditions or gastrointestinal conditions; there were higher reports of infective and parasitic disease, neoplasms, all of the mental disorders, migraine and deafness (but not disorders of refraction or other nervous system disease), all skin conditions, musculoskeletal disorders and symptoms and signs. Adjustment again did not greatly affect the prevalences or relative prevalences for any disease group.

Table 4 shows the prevalence of reports of chronic conditions and the relative prevalence compared to population expectations, both unadjusted and adjusted for non-response. Adjustment for chronic conditions was more successful than for recent conditions. Only five were too infrequent to model, only one model contained no independent variables, while the remaining 31 were adjustable. The most prevalent conditions were disorders of refraction, back disorders, deafness, hay fever, hypertension and eczema. There were more reports than expected of rashes, nerves, haemorrhoids, eczema, infective and parasitic disease, injuries, neoplasms and other mental disorders (under which PTSD is coded). Again, only small changes occurred to the prevalence or relative prevalence estimates after adjustment for non-response; 9 were slightly lower, 21 were slightly higher, and one was the same. The 99% confidence interval for the relative prevalences included 1.00 for only 6 of the 37 disease groups: disorders of refraction, heart disease, colds and asthma, other musculoskeletal disorder and disabilities; in all of the remaining disease groups, veterans reported significantly more morbidity than population expectations.

The Relation of Illness to Combat

Two measures of combat exposure were available.[21] One was derived from information from Army records and was based on being posted to units with increasing combat exposure, weighted by the length of posting. The other was a 21-item self-report inventory comprising questions on different aspects of war stress exposure. The two different measures gave quite different results, despite being moderately correlated (r = 0.44). Those subjects who were posted to a combat unit compared with those who were not reported more recent treatment for depression ($P = 0.040$) and deafness ($P = 0.0495$), and more chronic deafness ($P = 0.049$) and other skin conditions ($P = 0.029$). None of the remaining conditions was statistically significant. Higher self-reported combat exposures, on the other hand, were reported by men who had recent treatment for nerves, depression, other mental disorders, hernia, eczema, back disorders, and for symptoms and signs. Higher combat was also significantly related to reports of chronic infective and parasitic disease, nerves, other mental conditions (which includes PTSD), deafness, ulcer, rash, rheumatism, and back disorders. Tables 5 and 6 show the odds ratios for increases in prevalence of each condition with increases in combat scale score (each successive quartile compared with the lowest). Clear linear monotonically increasing and dramatic 'dose-response' relationships are apparent for recent mental disorders. The relationship for hernia is less obvious, with no cases occurring in the lowest and highest combat quartiles. While there was a statistically significant linear association of eczema with combat there was also a significant cubic trend ($F_{1,632} = 4.55$, $P = 0.033$), which makes interpretation more problematic. The linear trends evident in recent asthma, rash, and other musculoskeletal disorders failed to reach statistical significance. For chronic conditions, again the mental disorders show increasing linear relationships with combat, except for depression, which failed to reach significance. Deafness also increased with combat exposure, as did ulcer. Chronic infective and parasitic disease showed a significant quadratic relationship with combat ($F_{1,632} = 4.39$, $P = 0.037$), while rheumatism showed significant quadratic trend ($F_{1,632} = 8.15$, $P = 0.004$).

DISCUSSION

Methodological weaknesses of this study are common to all epidemiological field investigations. Of the three major hazards to inference in observational studies, selection, measurement and confounding errors, selection errors were addressed by adjustment for non-response using military data available for the cohort. This produced little change in estimates, giving confidence in the representativeness of the sample. Measurement issues were addressed procedurally: the ABS interview, manual, coding materials and computerized data were used, although interviewer characteristics and training were undoubtedly different. The effect of clinical and academic interviewers compared with ABS lay interviewers, particularly as these may interact with veteran status, is unable to be determined

TABLE 4 *Prevalence of chronic medical conditions reported by Australian Vietnam veterans and their relative prevalences compared with the age-sex standardized Australian population both unadjusted ('raw') and adjusted for response bias*

	Obtained prevalence	Obtained RR (99% CI)	Response adjusted prevalence	Response adjusted RR (99% CI)
Infective and parasitic disease	4.2	4.79 (2.47, 10.77)	4.6	5.20 (2.79, 7.62)
Neoplasms	7.8	4.51 (2.93, 8.65)	8.2	4.82 (3.18, 6.46)
Endocrine system:				
Cholesterol	11.1	2.75 (1.96, 4.85)	11.0	2.73 (1.94, 3.52)
Diabetes	3.9	2.72 (1.35, 6.26)	3.8	2.71 (1.32, 4.09)
Gout	9.4	3.11 (2.12, 5.70)	9.6	3.21 (2.21, 4.22)
Other endocrine disorders	6.1	3.13 (1.88, 6.37)	9.6	4.96 (3.42, 6.51)
Diseases of blood-forming organs	0.8	3.23 (0.0, 12.62)	0.8[a]	3.29 (0.0, 7.07)
Mental disorders:				
Nerves, nervousness	10.9	8.87 (6.30, 15.73)	12.2[b]	9.95 (7.23, 12.67)
Depression	2.2	3.49 (1.12, 9.56)	2.2[a]	3.47 (1.11, 5.83)
Other mental illness	5.3	4.15 (2.37, 8.77)	6.0	4.69 (8.80, 6.58)
Sensory/nervous system disorders:				
Disorders of refraction	48.8	1.09 (0.98, 1.48)	47.7	1.08 (0.96, 1.19)
Deafness	30.3	4.90 (4.14, 7.14)	30.0	4.91 (4.15, 5.68)
Migraine	6.9	2.30 (1.44, 4.45)	7.5	2.50 (1.61, 3.39)
Other sensory/nervous	12.6	2.26 (1.66, 3.88)	12.2	2.19 (1.59, 2.79)
Circulatory system:				
Hypertension	18.4	2.08 (1.63, 3.31)	19.0	2.17 (1.71, 2.62)
Heart disease	3.6	2.02 (0.96, 4.77)	3.4	1.98 (0.91, 3.05)
Haemorrhoids	12.5	6.90 (5.04, 11.88)	13.5	7.43 (5.51, 9.34)
Other circulatory system	7.8	2.07 (1.35, 3.97)	8.9	2.39 (1.61, 3.17)
Respiratory system:				
Colds	0.2	1.96 (0.0, 14.74)	0.2[a]	1.98 (0.0, 7.06)
Hay fever	19.0	1.54 (1.21, 2.43)	19.7	1.59 (1.27, 1.92)
Asthma	3.9	0.87 (0.43, 2.00)	4.1	0.91 (0.46, 1.36)
Bronchitis, emphysema	8.6	3.91 (2.62, 7.33)	8.8	4.13 (2.78, 5.47)
Other respiratory	4.5	3.88 (2.07, 8.57)	4.6	4.00 (2.15, 5.85)
Digestive system:				
Ulcer	6.9	2.83 (1.77, 5.60)	6.5	2.72 (1.67, 3.76)
Hernia	8.3	3.28 (2.17, 6.21)	7.9	3.18 (2.08, 4.28)
Other digestive diseases	9.0	3.23 (2.19, 5.98)	8.3	2.98 (1.97, 3.99)
Genitourinary system	3.6	2.31 (1.09, 5.43)	3.6[b]	2.34 (1.10, 3.57)
Skin:				
Rash	6.9	21.26 (13.29, 42.03)	8.6	26.61 (17.77, 35.45)
Eczema	15.4	6.29 (4.79, 10.35)	15.8	6.42 (4.91, 7.92)
Other skin diseases	7.0	3.04 (1.91, 5.97)	7.5	3.25 (2.09, 4.41)
Musculoskeletal disorders:				
Arthritis	15.1	1.46 (1.11, 2.42)	15.1	1.48 (1.12, 1.84)
Rheumatism	2.5	2.81 (1.02, 7.39)	2.5[a]	2.85 (1.04, 4.66)
Back disorders	36.3	1.77 (1.53, 2.51)	37.1	1.81 (1.57, 2.05)
Other musculoskeletal	12.2	1.20 (0.87, 2.07)	12.6	1.23 (0.90, 1.56)
Disability	0.9	1.14 (0.0, 4.17)	0.9[a]	1.14 (0.0, 2.34)
Injury	7.0	4.72 (2.97, 9.29)	7.2	4.86 (3.09, 6.63)
Symptoms, signs and ill-defined conditions	9.0	2.75 (1.86, 5.09)	9.1	2.77 (1.88, 3.66)

[a] Fewer than 21 cases: adjustment for eligible population age distribution only.
[b] Logistic model contained no independent variables.

TABLE 5 *Odds ratios for risk of recent illness conditions with each quartile of the combat index compared with the first (lowest) quartile, and the* P*-value of the t-test of association with the (continuous) combat score*

	1st quartile	2nd quartile	3rd quartile	4th quartile	*P*
Infective and parasitic disease	1.00	2.04	1.93	1.89	0.195
Neoplasms	1.00	0.34	1.03	1.35	0.150
Endocrine system:					
Cholesterol	1.00	0.98	1.21	1.08	0.801
Diabetes	1.00	2.36	3.22	3.44	0.538
Gout	1.00	0.92	0.67	1.15	0.712
Other endocrine	1.00	0.79	1.34	1.15	0.802
Mental disorders:					
Nerves, nervousness	1.00	4.32	6.84	7.32	0.003
Depression	1.00	1.05	1.34	2.58	0.025
Other mental illness	1.00	1.57	4.83	7.75	0.008
Sensory/ nervous system disorders:					
Disorders of refraction	1.00	2.75	2.01	1.29	0.879
Deafness	1.00	0.79	0.80	1.72	0.993
Migraine	1.00	0.42	0.70	0.46	0.068
Other sensory/nervous	1.00	0.67	0.46	0.74	0.648
Circulatory system:					
Hypertension	1.00	1.14	1.02	0.86	0.338
Heart disease	1.00	1.31	0.54	1.72	0.527
Haemorrhoids	1.00	1.18	1.21	0.43	0.629
Other circulatory	1.00	1.57	1.61	2.87	0.873
Respiratory system:					
Colds	1.00	1.35	2.18	1.35	0.651
Hay fever	1.00	0.56	0.63	0.68	0.676
Asthma	1.00	1.97	2.41	3.44	0.063
Bronchitis, emphysema	1.00	1.57	1.61	2.58	0.351
Other respiratory	1.00	0.51	0.59	0.64	0.156
Digestive system:					
Ulcer	1.00	0.39	0.94	1.15	0.284
Hernia	[a]	1.00	6.84	[a]	0.011
Other digestive diseases	1.00	2.27	2.24	2.20	0.100
Genitourinary system	1.00	2.36	1.61	1.72	0.667
Skin:					
Rash	1.00	3.30	3.54	3.10	0.069
Eczema	1.00	3.14	2.01	4.30	0.007
Other skin diseases	1.00	0.69	0.75	0.91	0.809
Musculoskeletal disorders:					
Arthritis	1.00	1.18	1.41	1.40	0.216
Rheumatism	[a]	[a]	1.00	[a]	0.862
Back disorders	1.00	2.16	2.21	2.37	0.047
Other musculoskeletal	1.00	1.97	2.11	2.26	0.066
Disability	[a]	[a]	1.00	[a]	0.727
Injury	1.00	1.22	1.34	1.72	0.466
Symptoms, signs and ill-defined conditions	1.00	1.08	1.22	1.28	0.029

[a] No cases in quartile.

TABLE 6 *Odds ratios for risk of chronic conditions with each quartile of the combat index compared with the first (lowest) quartile, and the P-value of the t-test of association with the (continuous) combat score*

	1st quartile	2nd quartile	3rd quartile	4th quartile	*P*
Infective and parasitic disease	1.00	0.26	0.94	1.72	0.024
Neoplasms	1.00	1.38	1.31	1.51	0.150
Endocrine system:					
Cholesterol	1.00	1.81	1.45	1.64	0.419
Diabetes	1.00	0.56	0.92	0.61	0.557
Gout	1.00	1.48	1.79	1.34	0.642
Other endocrine disorders	1.00	1.18	1.34	2.01	0.084
Diseases of blood-forming organs	1.00	1.57	0.80	0.86	0.746
Mental disorders:					
Nerves, nervousness	1.00	2.36	3.08	3.16	0.005
Depression	1.00	3.14	3.22	4.30	0.096
Other mental illness	1.00	1.57	2.68	4.30	0.002
Sensory/nervous system disorders:					
Disorders of refraction	1.00	1.07	1.14	1.07	0.664
Deafness	1.00	1.49	1.29	1.69	0.014
Migraine	1.00	0.66	0.67	0.86	0.965
Other nervous/sensory	1.00	0.83	1.02	0.82	0.559
Circulatory system:					
Hypertension	1.00	1.30	1.25	1.42	0.298
Heart disease	1.00	1.10	0.64	1.03	0.740
Haemorrhoids	1.00	0.55	0.80	1.08	0.392
Other circulatory	1.00	0.63	1.37	1.29	0.470
Respiratory system:					
Colds	[a]	[a]	1.00	[a]	0.559
Hay fever	1.00	0.68	0.97	0.86	0.948
Asthma	1.00	0.79	0.69	0.49	0.272
Bronchitis, emphysema	1.00	1.57	1.52	0.96	0.816
Other respiratory	1.00	0.79	1.74	0.57	0.546
Digestive system:					
Ulcer	1.00	0.69	1.21	1.72	0.042
Hernia	1.00	1.24	0.67	0.79	0.375
Other digestive diseases	1.00	0.97	0.87	0.99	0.611
Genitourinary system	1.00	0.66	1.07	0.57	0.697
Skin:					
Rash	1.00	3.93	2.68	4.59	0.041
Eczema	1.00	1.20	1.04	1.72	0.062
Other skin diseases	1.00	1.18	1.11	1.51	0.428
Musculoskeletal disorders:					
Arthritis	1.00	1.31	1.56	1.61	0.057
Rheumatism	a	1.00	11.26	4.38	0.006
Back disorders	1.00	1.35	1.24	1.48	0.044
Other musculoskeletal	1.00	0.69	1.33	0.91	0.988
Disability	1.00	0.39	0.40	0.86	0.723
Injury	1.00	1.01	1.84	1.48	0.736
Symptoms, signs and ill-defined conditions	1.00	0.79	1.54	1.17	0.290

[a] No cases in quartile.

within the current study, thus any interviewing bias remains unknown. Moreover, without physical examinations it is difficult to know whether the excess reports of illness can be substantiated by signs of disease. The CDC study, which did include physical examination,[15] found that Vietnam veterans self-reported more illness than their peers in a telephone interview,[22] but that few differences were discernible on examination. This does not necessarily entail that self-report is factitious, as diagnosis is not confined or limited entirely to the presence of palpable signs. Indeed, in the survey context, underreporting is presumed to be of greater significance than overreporting, with survey methodology often aimed at reducing undercounting. In previous studies of Australian Vietnam veterans[23] underreporting as well as overreporting were quite high when compared with medical record evidence.

Whether before or after adjustment for potential response bias, veterans reported significantly more recent infective and parasitic disease, neoplasms, high cholesterol and other endocrine disease, more mental disorders, migraine, hay fever and other respiratory conditions, ulcers, skin conditions, musculoskeletal disorders except rheumatism, injuries and symptoms, signs and ill-defined conditions. They did not report more recent diabetes or gout, sensory or nervous system disorders (except migraine), digestive disorders (except ulcer), and disabilities. They reported all chronic conditions significantly more often except heart disease, asthma, disabilities and other musculoskeletal disorders, and the relatively rare blood diseases.

It might be expected that socioeconomic status differences are associated with reported illness, however compared to the Australian population, veterans had similar employment and schooling status, but had higher educational achievement and higher incomes.[21] Past employment, however, remains a possible cause of higher reports: for example, in addition to the excess reports of skin conditions there were 50 conditions coded as neoplasms, which included 39 skin cancers. Of these, 20 veterans volunteered that they were due to sun exposure while working outdoors. Of the 50 cancers, there were four reports of 'melanoma', one 'hairy-cell leukaemia', one 'bladder cancer', one 'mouth cancer' (initially discovered by a dentist), one 'brain tumour', one 'benign growth on larynx', one 'bowel cancer', 37 skin cancers and three ill-defined cancers (variously described by veterans as 'cancerous lumps on stomach', 'benign cancer lumps' and 'various tumours and lumps'). There were three described as 'benign'. Survey evidence for the presence of illness is notoriously uncertain. In the case of neoplasms, the appropriate diagnostic armaments[24] were not available to produce definitive prevalence estimates. If one assumes that the more specific descriptions of cancer were more likely to have arisen where a diagnosis was received and actual treatment given, then there remain eight non-skin cancers; if the skin cancers which were reported were also accompanied by reports of surgery then this adds another six cases for a total of 14, where 11.1 would be expected from ABS population prevalence estimates. However, these estimates also include benign neoplasms in the category 'neoplasms'—tumour, cyst or growth. Twelve of the cancers were attributed by the veteran to exposures to sun or chemicals while in Vietnam. Notably, higher rates of skin cancers have been recently reported for World War II servicemen stationed in the Pacific.[25]

It has been reported that participation in combat may lead to overreporting of symptoms[26] in American Vietnam veterans, contrary to findings from the Israeli Army[1] that participation in combat *per se* may not lead to physical illnesses. This study suggests that both may be correct, but for different reasons. Higher combat was associated with chronic ulcer, as reported elsewhere.[8,9] Musculoskeletal disorders may also be associated with the physical rigours of combat training and combat conditions. It is also possible that combat exposure, taking place mainly in tropical rural areas, might be a proxy for exposure to conditions facilitating infective and parasitic disease, as has also been found in other South East Asian veterans of World War II,[8,9,13] and to other persistent fungal infections, hence the relation with skin conditions. Alternatively, skin conditions may be a manifestation of psychological conditions arising from combat exposure.[1] The relationship of combat to mental conditions is to be expected given what is known about combat and psychological disorders.[14,17,27–31] An increased propensity to complain as a result of mental disorders attributable to combat, however, is not consistent with the lack of observed relationship of combat with the majority of disease classes.

The differential associations of the two measures of combat may indicate that these are not measuring the same underlying construct. For example, being posted to a combat unit during one's tour in Vietnam may not necessarily have led to combat: for the Australian forces in Vietnam, the conflict proceeded through various stages of danger between 1964 and 1972,[32,33] and roles varied for individual soldiers within postings. Whatever the danger, combat postings would be associated with explosives and gunfire, hence the association of deafness with posting and with combat exposure. Thus we conclude that combat exposure has not increased self-reports of recent or chronic conditions except due to

factors associated with, but not necessarily caused by combat.

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APPENDIX 4.1 - MARSHALL RP, JORM A, GRAYSON DA, O'TOOLE BI. DO VETERANS USE MORE HEALTHCARE SERVICES? HEALTHCOVER. 1998;8(3):24-27.

Health care consumption by veterans raises doubts about co-payment effect

In planning and negotiating health care arrangements for veterans, it has often been proposed that they tend to be higher users of health services. Various authors and veterans' health services reviews have speculated on the extent to which veterans have special health needs. This manuscript examines in detail the health care consumption aspect of this question. The authors suggest the findings can help treating practitioners and health service managers involved in contracting for health care provision to this group to test some of the preconceptions about the demand characteristics of Vietnam veterans as an important community patient group. The article throws some light on veterans' health care utilisation levels and also indirectly provides evidence that co-payment policies that prevent "first dollar" insurance options in the general community probably do not influence health care consumption levels as intended.

Do veterans use more health care services?

Richard P. Marshall[§], Anthony Jorm[§§], David A. Grayson[§§§] and Brian I. O'Toole[§§§§]

Objective: To compare the health care consumption data from an epidemiological study of Vietnam veterans and age sex matched peers in the community.

Data sources: Self-reported health care consumption data from an epidemiological study of Vietnam veterans and matching data from the Australian Bureau of Statistics (ABS) National Health Survey. The ABS National Health Survey questionnaire was administered to both subject groups in the same time period.

Subjects: Community samples of 641 randomly selected Vietnam veterans and 11,468 age and sex matched general community peers.

Measures used: The health care consumption measure used was the estimated cost of the health care services that the subjects reported using. The health status measure was the number of diagnoses reported by the subjects.

Results: The groups were compared on health care consumption by regression analysis to allow age and number of diagnoses to be controlled and provide dollar estimates of fortnightly cost differences between the groups. Increased health care consumption was associated with an increase in 5-year age group ($3.50 per fortnight, $p<0.05$). Each additional diagnosis added $30 per fortnight ($p<0.001$). When age and diagnoses were controlled, veterans did not consume any more health services than community controls.

Conclusion: Veterans do not demonstrate an excess consumption of health care relative to their community peers when their worse health is taken into account. This observation should be of interest to both providers of health care for veteran groups and also as an indicator of the effectiveness of the current co-payment policies.

Veterans' health care services are negotiated by the Department of Veterans' Affairs (DVA) directly with providers. Both the private and public providers provide hospital and community services.

Services obtained through this system are completely without charge to veterans, unlike most of the community for whom only a minor proportion of all health care services are bulk billed and therefore free at point of delivery. These arrangements also apply to pharmaceuticals prescribed for veterans.

Therefore, veterans who are entitled to use DVA funded services do not have the co-payment disincentive against overuse that is present for the non-veteran community. It follows that, if the co-payment is working as an overuse disincentive, the rest of the community should be consuming less health care *per capita* than veterans.

Popular commentaries such as **Whiting**'s book *Be In It Mate*[1] have portrayed veterans as excessive consumers of health care services. These preconceptions, usually based on a few

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extreme examples of high health care users, are sometimes transferred to more recent veterans.

They also sometimes lead to the suggestion that, in a community which provides universal health services, the provision of a dedicated health care entitlement arrangement for veterans has provided an unwarranted incentive for disproportionate service use by this community group.

Against this is the view that Australia has the responsibility to provide superior health care to its veterans, particularly those whose defence service was not voluntary. This is recognised by the Commonwealth's accepting a special obligation to the veteran community as part of the Commonwealth's defence commitment[2].

The particularly damaging effects of war service on health are also acknowledged by many studies, two examples of which are cited here[3,4]. A detailed comparison of the health status between Vietnam veterans and the general population was provided in an earlier paper from the Australian Vietnam Veterans Health Study[5].

However, the question remained: "Allowing for the state of their health and their consequent need for health services, are veterans higher consumers of health care than the general population?"

The opportunity to investigate this issue arose during further analysis of the health service consumption patterns in data from the Australian Vietnam Veterans Health Study[6] and the Australian Bureau of Statistics (ABS) National Health Survey[7].

Interviews for the 641 subjects in the Australian Vietnam Veterans Health Study were conducted at the same time as the ABS National Health Survey.

The National Health Survey, which is conducted every five years, contains detailed questions on use of health services over the fortnight immediately preceding the interview. It also contains questions on the health state of the respondents.

The veterans study used the same questionnaire, manual and interviewer training. Combining the data from the two studies thus provided a massive community "control group" of 11,468 subjects in the same sex and age categories as the veteran subjects.

The *aim* of the study was to compare service consumption levels in veterans with those in the general population, controlling for the effect of age and a number of diagnoses.

The *hypothesis* examined in this study was that after controlling for health and age, veterans are higher consumers of health care than the general population.

Method

The *subjects* examined in this study were 641 Vietnam veterans interviewed from a random non-clinical sample of 1,000 veterans. Of the 1,000 veterans sampled, 213 could not be found, 50 were known to have died, 61 refused interview and 35 were unable to be interviewed in the time available[6]. This represented a response rate of 91% of the living veterans who could be located.

The community comparison subjects were the 11,468 males between 35 and 70 in the ABS89 data set. The ABS subjects were also randomly selected from the community[7].

The *dependent variable* of health care consumption was calculated from subjects' reports in the ABS health interview on seven types of health services used. These services were weighted according to scheduled fee[8] or average cost in 1991-92 values[9, 10]. Further details of the weightings are included in *Attachment 1* to this paper.

The *current health state* indicator used was the number of diagnoses reported in the ABS survey. *Age at time of interview* was also included as a predictor factor within the model because age is a known predictor of health service use[11].

Analysis

Health care consumption levels of veterans and general community peers matched for age and health status were compared.

The data from the 641 veterans' interviews on the ABS89 health survey were merged with the unit record data from the 11,468 males between 35 and 70 in the ABS89 data set.

Mean health care consumption was compared within age cohorts between veterans and community males. A similar comparison was made of means within subgroups that reported the same number of diagnoses.

Finally, a regression analysis compared the relative effects of veteran status, age and health problems.

Results: veterans with community peer comparisons

When examined by 5-year age cohorts, the younger group of veterans (aged 40 to 44 years, n=315) appeared to consume much higher levels of health care ($77.55 fortnightly) than their community counterparts ($34.88 fortnightly).

This consumption difference was significant when examined by a *t* test ($p<0.001$), but mean consumption of the veteran and community samples converged as the age group increased. None of the other age groups displayed a significant difference between veterans and community males in mean health care consumption.

High outliers and/or non users of services were included in the calculation of means to fully represent all reported costs when used in the modelling.

As already mentioned, the mean values produced then have to be interpreted carefully if used as comparison standards at the individual level.

For "typical" consumers, the means were skewed by the 250 highest consumers (2%) who accounted for 41% of the total reported costs, while 24% of subjects used no services in the reporting period.

The skewing effects of these atypically high cost health care consumers and non users were examined by ranking cost of services and comparing the mean rank between veterans and community males.

The relative mean of the consumption of the younger veterans was reduced by this transformation, indicating that outliers may well have contributed disproportionately to the higher mean consumption in the younger veteran group.

Unexpectedly, it also evened out the large community sample, so that veterans' health care consumption measured on this scale became consistently marginally (though not significantly) higher across all age groups compared to the community.

The relationship between number of diagnoses reported and health service consumption showed a general linear relationship when examined graphically (up to six diagnoses, after which the number of subjects became small).

No difference was evident between veterans and community peers with similar numbers of health problems.

Table 1 shows the relationship be-

Table 1

Regression analysis of predictors in community and veteran samples combined§

Variable	Predictors of cost of health services used			
	Individually	Controlling for age	Controlling for health status	All three variables in model
	Beta $	Beta $	Beta $	Beta $
Age in 5-year intervals	9.02**		3.59*	3.52*
Diagnoses	31.44**	29.96**		30.06**
Whether veteran	ns (12.04)	ns (22.34)	ns (-10.06)	ns (-5.11)

** p<0.001 * p<0.05 ns: not significant (p>0.05)

§ ABS89 Health Survey males aged 35-70 (n=11,468) and AVVHS sample (n=641) combined

tween health care consumption and the predictor variables of age, number of diagnoses and veteran status. The effects of these variables are shown when examined individually and then after the effects of age and/or diagnoses were controlled.

As expected, diagnoses were the strongest predictor of health service cost. Each additional diagnosis increased cost of health service expenditure by about $30 per fortnight (p<0.001), even after controlling for age and veteran status. Age was also a significant contributor ($9 per 5-year increase, p<0.05).

It was only in the one age group mentioned above where veterans were found to have significantly high health care consumption. This group also reported higher numbers of health problems.

Overall, veteran status alone had no significant relationship with cost of health care services used. After number of diagnoses was controlled, not only was there no significant relationship between veteran status and higher health service consumption; the beta co- efficient was in the wrong direction to suggest such a relationship.

Discussion

Our data suggest that veterans are not higher users of health services once allowance is made for their worse health. Further, no evidence was found that there are more atypical high health service users among veterans than in the general population.

In considering the trends indicated by this analysis, it should be noted that these findings are based on aggregated data. These "untrimmed" results are of most value as indicators of health service wide effects. They are thus appropriate as guides for formulation of priorities for preventive interventions and for planning of services for emergency and defence personnel after deployments.

However, caution should be exercised in applying these observations as indicators of "typical" individual service consumption patterns.

A number of issues arise in identification of factors predicting health care consumption.

The first to be considered is the normal effect of ageing on use of health care services and its interaction with the presence of other variables measured, in particular veteran status.

It was found that the random sample of male veterans appeared to use more health care services than age matched men in the general community. However, where this occurred it was because they tended to have more health problems.

This observation is useful as it addresses concerns about potential overservicing of veterans because of easier access once entitlement to totally free health care is available.

In the present analyses, the utilisation data are self-reported and retrospective. While a short, recent reporting period was used to minimise this bias, patient reports could be affected by selective remembering based on the importance and significance attributed by the subject to the recalled event[12, 13].

Over-reporting of health service usage may prevail for people seeking to maximise the reported severity of their illness for compensation purposes or to obtain sympathy/attention as with the problem of hypochondriasis[14].

We may also hypothesise under-reporting for patients wishing to hide, deny or avoid dealing with their disease[15, 16, 17]. This also may be the case in people who fear some adverse career effect if an employer were to learn of a health problem, or in stoical people not wanting to give up time from other pursuits to deal with their disorder.

None of these potential reporting biases are likely to be more influential in veterans than in the general population.

A number of questions on the measurement effects observed need to be followed up. These include the determinants of the large variability of health service costs in both the ABS sample and the veteran sample.

Further investigation of the component parts of the total cost is needed, particularly covering a larger time frame than the two weeks report that was available for this study.

Particular attention might be paid to whether there is a qualitative difference in the predictors of admission to hospital, use of specialist services, use of GP services, use of allied health practitioners, and pharmaceutical consumption.

In conclusion

Our data are inconsistent with the preconception that veterans are higher users of health services simply because they are veterans receiving free care.

The relationship between use of services by veterans and their worse health was clearly demonstrated. When this is taken into account, veterans' consumption of health care is no higher than their community peers.

This finding does not support the view that the co-payment required from the general community has any value in controlling demand for health care.

Acknowledgments

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The findings and views expressed in this report are those of the authors and are not to be taken as the official opinion of the Department of Defence (Army Office) or the Department of Veterans' Affairs.

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Attachment 1

For the cost of health care consumption variable we calculated a dollar value for the services used by introducing a unit cost to each of the items used. Unit costs used were published average costs or prices for the year 1991-92 when the interviews were completed.

The variables constructed and cost weighting applied were:

Hospital bed day $542.26
Allied health visit $28.88
Prescription $14.40
Hospital outpatient $19.60
Doctor visit $36.33
Dental visit $37.50
Vitamin prescription $14.40

Information was obtained from the Australian Institute of Health and Welfare (**Mark Cooper-Stanbury, Michael Cook**); Department of Veterans' Affairs (Schedule of Fees for DVA Providers); Pharmaceutical Benefits, Department of Human Services and Health (**Andrew Mitchell**) and the following references:

1. Cooper-Stanbury M, Solon R, Cook M. Hospital utilisation and costs study 1991-92. Volume 1, A survey of public hospitals and related data. Canberra: Australian Institute of Health and Welfare, AGPS, 1994.
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APPENDIX 5.1 - MARSHALL RP, GRAYSON DA, JORM A, O'TOOLE B, DOBSON M. HELP SEEKING IN VIETNAM VETERANS: POST-TRAUMATIC STRESS DISORDER AND OTHER PREDICTORS. AUSTRALIAN & NEW ZEALAND JOURNAL OF PUBLIC HEALTH. 1997;21(2):211-213.

Help-seeking in Vietnam veterans: post-traumatic stress disorder and other predictors

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Abstract: This study investigated factors predicting help-seeking from the Department of Veterans' Affairs (DVA) by Vietnam veterans. Data used were from a national Australian survey of Vietnam veterans' health (n = 641) conducted between July 1990 and April 1993. The survey involved current clinical assessments and retrospective questionnaires, supplemented with health and service records retrieved from the DVA and Army personnel files. Measures included the 1989–90 Australian Bureau of Statistics Health Survey questionnaire, and mental health, sociodemographic and operational deployment history questionnaires. For both current and lifetime diagnoses of post-traumatic stress disorder, a third of the veterans with the disorder had never obtained any health care entitlement from the DVA. Other than physical and mental problems, which accounted for the greatest proportion of the help-seeking odds, significant factors predicting help-seeking included factors such as: predeployment personality, combat exposure, the veterans' own attitudes towards their deployment, experiences during deployment, experiences during repatriation and membership of ex-service organisations. These findings on how post-traumatic stress disorder and other health problems relate to help-seeking patterns could help in developing prevention and care programs for stress disorder. (*Aust N Z J Public Health* 1997; 21: 211–13)

ONE of the most intractable problems associated with veterans who have served their country in wars, peacekeeping and other operational deployment is how to get those who most need health care and welfare services to ask for them.[1] In considering the factors that relate to help-seeking, post-traumatic stress disorder is of particular concern among the health problems that affect veterans. It is a direct consequence of their service, is highly prevalent, and is often severely disabling and chronic.[2–4] In particular, it includes symptoms of avoidance of anything that may remind the sufferers of their traumatic experiences. These symptoms are likely to interfere with appropriate help-seeking.[5–8] Over 50 000 service personnel were deployed in Australia's operational commitment during the Vietnam war and about 24 000 have so far sought help by lodging claims for health care or disability benefits with the Department of Veterans' Affairs (DVA).

The term 'post-traumatic stress disorder' was first used in 1980.[9] However, descriptions of mental and physical health problems associated with war service date back hundreds of years. After World Wars I and II there were many manifestations of mental and physical health problems described by terms ranging from 'shell shock' to 'neurasthenia'.[10] More recently, specific attention has been directed to the link between war-related trauma and subsequent behaviour and illness.[11]

A factor that has been suggested as associated with both post-traumatic stress disorder and seeking help from the DVA is alcohol abuse or dependence. Its association with post-traumatic stress disorder has been linked to a self-medication dynamic.[12,13] It has been reported that the disabling effects of alcoholism increase DVA claims directly.[14]

Ideally, help-seeking should be related to how sick the veterans are, as indicated by their physical and mental health profiles. However, nonhealth factors, including social background, service profile, attitudes towards deployment, and membership of ex-service organisations, may also be involved.

Our study aimed to identify the factors that influence help-seeking behaviour in veterans, using information obtained in a comprehensive records search, questionnaire battery and interview. These data covered the periods before enlistment, before being deployed, during deployment and after return.[15]

Method

Subjects were 641 Vietnam veterans from a random sample of the nominal roll of those posted to Vietnam who were interviewed between July 1990 and April 1993. Methods of locating and contacting the subjects and response details are reported elsewhere.[15] Of the 1000 subjects sampled, 213 could not be found, 50 were known to have died, 61 refused interview, and 35 could not be interviewed.

The dependent variable of help-seeking was defined as self-report of entitlement to health care and a disability pension from the DVA. This is a robust measure of motivation to obtain services from the DVA, as veterans must pursue a formal claim process involving medical examinations and provide reasonable argument connecting the war service with each condition for which treatment and a disability pension is claimed.[16]

From the data collected, 73 independent variables were identified as likely to affect veterans' seeking medical or welfare assistance. These factors were then grouped into six blocks of factors, listed in Table 1. Each of the 73 was first examined for univariate associations with help-seeking and for intercorrelation. A subset of 39 variables was selected for the final model of six blocks of factors. The 34 vari-

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Table 1: Factors associated with use of health care by veterans interviewed about post-traumatic stress disorder (PTSD)

Block numbers and factors	β	% reduction in deviance For block	Adj [a]
1. Physical health		7	7
Each veteran high-risk diagnosis	1.61†		
Each veteran low-risk diagnosis	1.53†		
2. Mental health		7	5
Distressed by interview (14 points)	1.15†		
General mental symptoms (28 points)	1.12†		
Level of depression (20 points)	1.08†		
Marital dysfunction (32 points)	1.06†		
PTSD symptom scale (141 points)	1.03†		
PTSD lifetime diagnosis (0–1)	2.74†		
PTSD avoidance symptoms (max 20)	1.19†		
Agoraphobia symptoms (max 5)	1.47*		
Social phobia symptoms (max 5)	1.21*		
Simple phobia symptoms (max 5)			
Lifetime alcohol symptoms (max 9)			
3. Predisposition		6	4
Measured intelligence level (1–20)			
Personality self-orientation symptoms (max 7)			
Antisocial personality indicators (max 10)	1.10*		
Reluctant to go to Vietnam (0–1)	0.22†		
Significant others opposed to deployment (max 3)			
Personally committed to Vietnam war (0–1)	5.12†		
Felt ill-trained or ill-prepared (0–1)	0.37*		
Age at start of first deployment	1.05*		
Noncombat stressors during deployment (max 14)	1.23†		
4. Deployment profile		7	4
Deployed alone and not with a unit (0–1)	0.52†		
Combat incident exposure (max 21)	1.12†		
Combat role of unit (max 13)	1.09*		
Disciplinary charges during service			
Service experience before Vietnam	1.06*		
5. Repatriation		5	3
Pleasure in leaving Vietnam (max 2)	0.57*		
Talking about Vietnam first 6 months (max 5)			
Experience of discrimination over deployment (0–1)	2.97†		
Reluctant to reveal veteran status (max 4)	1.14*		
Arguments or fights over Vietnam involvement (max 2)	2.02†		
Often think about Vietnam (0–1)	7.78†		
Anger at others over Vietnam (max 2)	1.77†		
Shame over Vietnam service (0–1)	3.57		
6. Ex-service membership		3	2
Active RSL [b] member (max 2)	1.48†		
Active VVAA [c] member (max 2)	1.30†		
Active unit association member (max 3)	1.39†		
Closeness with other veterans (max 7)	1.09*		

Notes:
(a) Reduction in deviance after controlling for physical health.
(b) RSL = Returned Services League.
(c) VVAA = Vietnam Veterans' Association of Australia.
*$P < 0.05$, †$P < 0.001$

ables not included in the model were either highly correlated with, or were linear combinations of, other factors.

Predictor block analyses were then conducted, examining reduction in deviance for each block of factors. Each of the six blocks was tested alone as an alternative predictor model of the veteran's propensity to seek help. We then examined each block as a predictor of help-seeking after controlling for physical health. Lastly, we examined the reduction in deviance for the complete model when the six blocks were fitted sequentially in the order shown in Table 1.

Results

Post-traumatic stress disorder and uptake of DVA services

Based on the AUSCID-V post-traumatic stress disorder clinical interview,[15] and the self-completed questionnaire, 22 per cent of veterans were diagnosable as having suffered from post-traumatic stress disorder at some time following their deployment. The group of subjects with post-traumatic stress disorder was split between those who had sought and obtained help from the DVA (14 per cent of all) and those who had not sought and therefore not obtained help from the DVA (8 per cent of all veterans—equivalent to 3900 people in the total population of 50 000 veterans). Half of this latter group were diagnosed with current post-traumatic stress disorder.

Univariate analyses

Univariate associations of the 39 variables selected for the final model are shown in Table 1. With the exception of simple phobias and (unexpectedly) alcohol abuse or dependence, all of the physical and mental health variables were found to be related to help-seeking. A positive relationship was found between primary family relationship dysfunction, indicated by the 32-point Dyadic Adjustment Scale,[17] and help-seeking (odds ratio (OR) = 1.06, $P < 0.001$).

Surprisingly, the presence of the post-traumatic stress disorder avoidance group of symptoms was not found to be a net inhibitor of help-seeking. Even after we controlled for other variables, these symptoms were positively related to DVA client status (OR = 1.20, $P < 0.05$).

Those veterans who did not want to be in the army or go to Vietnam did not tend to seek help from the DVA (OR = 0.31, 0.22, $P < 0.001$). However, those who were surrounded by people who opposed their involvement in Vietnam did tend to seek help (OR = 1.64, $P < 0.05$). Those who supported the war involvement were more likely to have contact with DVA (OR = 5.12, $P < 0.001$). Another significant contributor to help-seeking odds was the occurrence of personal, noncombat-related problems during deployment (OR = 1.23, $P < 0.001$).

The repatriation experience was also important, as indicated by the negative relationship between help-seeking and a positive homecoming attitude (OR = 0.57, $P < 0.05$) and the relationship between help-seeking and perceived discrimination or arguments over Vietnam participation (OR = 2.97, 2.02, $P < 0.001$).

Multivariate block analyses

We first examined the statistical deviance explained by each of the six blocks of variables separately. Physical health, mental health and deployment profile appeared to have the strongest association with help-seeking, each producing a reduction in deviance of 7 per cent (Table 1). We then examined to what extent each of the other blocks remained associated with help-seeking when physical health was controlled for.

By combining the reductions in deviance in help-seeking odds from each of the blocks, we might expect the maximum possible explanation of deviance of 35 per cent from the model if the blocks contributed independently. However, when we examined the complete model we found only 18 per cent reduction in deviance by all of the blocks of variables. Where a substantial part of the overlap occurred is shown in the last column. With the physical health block of factors controlled, we found a considerable reduction in the degree to which the other blocks of variables predicted help-seeking, leaving a total 'potential' effect of 25 per cent. This is closer to the observed full model effect of 18 per cent: so a large proportion of the overlap is between the physical health factors and each of the other blocks. This is also true for the mental health block.

Discussion

The level of post-traumatic stress disorder found in the Australian veteran sample is consistent with findings in similar studies of American Vietnam veterans and other service and emergency personnel.[8,18-20] Of special interest is that a substantial number of those with service-related post-traumatic stress disorder had not sought or obtained help from the DVA.

Veterans with war-related post-traumatic stress disorder were more likely to seek and obtain help from the DVA than those without. However, it remains a concern that over one-third of veterans who suffered from deployment-related post-traumatic stress disorder had not obtained help for this or any other condition from DVA. The hypothesised relationship between avoidance symptoms in post-traumatic stress disorder and failure to seek help from DVA was not supported by the findings. It is of some concern that veterans with better social supports (either before, during or after deployment) were less likely to have obtained DVA help for their health problems. Moreover, veterns with stronger marital relationships were also less likely to have sought and obtained professional help even where serious health problems existed.

Important implications of these findings are that help-seeking is strongly related to factors other than physical and mental health. Also, post-traumatic stress disorder may be going untreated, particularly among veterans with good social support. For policy makers, consideration should be given to automatic entitlement of post-traumatic stress disorder-diagnosed veterans to repatriation services. To ignore service-related post-traumatic stress disorder would be no more acceptable than if veterans suffering from physical wounds from their service were neglected.

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Disclaimer

The findings and views expressed in this report are those of the authors and are not to be taken as the official opinion of the Department of Defence (Army Office) or the Department of Veterans' Affairs.

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APPENDIX 5.2 - MARSHALL RP, JORM A, GRAYSON DA, O'TOOLE BI. POST-TRAUMATIC STRESS DISORDER AND OTHER PREDICTORS OF HEALTHCARE CONSUMPTION IN VIETNAM VETERANS. PSYCHIATRIC SERVICES. 1998;49(12):1609-11.

Posttraumatic Stress Disorder and Other Predictors of Health Care Consumption by Vietnam Veterans

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A total of 641 randomly selected Australian veterans of the Vietnam War were interviewed about their use of health care in the previous two weeks to determine what factors contributed to health care consumption. Seventy-three variables were examined by univariate linear regression and then grouped into seven categories relating to age, physical and mental health, predisposition to posttraumatic stress disorder (PTSD), deployment and repatriation experiences, and membership in veterans groups. PTSD was associated with an additional cost of $79 in health care for the two-week period. Each physical diagnosis was associated with an additional $28. Alcohol consumption was not related to health care costs. Other important variables contributing to costs were depression, educational status, the quality of the repatriation experience, and social support. (*Psychiatric Services* 49:1609–1611, 1998)

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In support of the U.S. intervention in South Vietnam, Australia sent 50,000 combat troops to the war. Half were conscripts. It has been demonstrated in many previous studies internationally that war service takes a heavy toll on the physical and mental health of many participants (1). One of the more common disorders among veterans is posttraumatic stress disorder (PTSD) (2).

For war veterans, variables related to health care consumption include age, exposure to combat (in terms of both recentness and intensity), the presence of injuries or other physical illnesses, subjects' attitudes toward their Vietnam service, and the availability of social supports (3).

Because most health care is focused on treatment of specific diagnosed disorders, our starting hypothesis was that the number of diagnoses veterans reported would relate closely to their health care consumption. The study reported here was designed to examine this relationship and also the relative effects of mental health and other factors on health care consumption.

Methods

Between January 1990 and April 1992, we interviewed 641 Vietnam veterans from a random sample of 1,000 veterans from the nominal roll of Australian soldiers who had been exposed to combat in Vietnam. The 641 veterans represented 87 percent of the 737 living veterans who could be located out of the group of 1,000 veterans (4).

Questionnaires about health and psychological state were administered to each subject. These were supplemented with psychological data from army personnel records and enlistment records held by the Defense Force. Health care consumption was calculated from veterans' self-reports of seven types of health services used in the two weeks before the interview weighted by the fee scheduled for payment by the federal government or the average cost of the service in 1991–1992. Costs are reported in U.S. dollars on the basis of the 1991–1992 exchange rate. We used the two-week period before the interview because it has been determined to be a robust recall period for self-report (5).

Outliers, or high users of services, were retained in the calculations to ensure that this small but important group would contribute to the aggregate cost estimates. Even though a short reporting window was used, only 14.5 percent of subjects were nonconsumers of any health care during the period because information about use of all health care, including medication (prescribed and self-obtained), was elicited.

We examined 73 predictor variables (6) that were relevant to the

Table 1

Regression analyses of seven categories of variables examined for associations with health care consumption by 641 Australian combat veterans of the Vietnam War [1]

Category and variable	Beta	R^2 of individual category	R^2 of category fitted sequentially
Age		0	0
Age when interviewed (measured in five-year intervals)			
Physical health		6	6
Each veteran high-risk diagnosis[2]	30.58**		
Each veteran low-risk diagnosis[2]	26.35**		
Mental health		8	6
Level of depression[2]	10.18**		
Marital dysfunction	3.01*		
PTSD current diagnosis	78.72**		
Total symptoms of phobias	8.38*		
Lifetime alcohol symptoms			
Level of anxiety	13.57**		
Predisposition to PTSD		3	2
Measured intelligence level			
Personality self-orientation symptoms			
Antisocial personality indicators			
Personally reluctant to go to Vietnam			
Significant others opposed deployment			
Personally committed to Vietnam War			
Felt ill trained or ill prepared			
Educational difficulties[2]	40.19**		
Age at start of first deployment			
Noncombat stressors during deployment	10.62*		
Deployment profile		2	1
Deployed alone and not with a unit			
Combat incident exposure	4.20*		
Combat role of unit			
Disciplinary charges during service			
Years of service experience pre-Vietnam			
Repatriation		4	1
Pleasure in leaving Vietnam			
Amount talked about Vietnam in the six months after deployment			
Experienced discrimination related to deployment	47.76 *		
Reluctance to reveal veteran status			
Experienced arguments or fights over involvement in Vietnam	30.09 *		
Often thinks about Vietnam	102.31**		
Anger at others over Vietnam	24.32*		
Shame over Vietnam service			
Gladness of others at return from Vietnam[2]	22.56*		
Membership in service-related organizations		1	0
Active in Returned and Services League			
Active in Vietnam Veterans Association	16.37*		
Active member of a unit association			
Closeness with other veterans			
Total		23	16

[1] The contribution of each category of variables in explaining the variance in costs was calculated for each category of variables (first R^2 column) and for each category added sequentially to the model (second R^2 column). The unstandardized beta coefficients can be interpreted as costs in dollars ($US at the 1991–1992 exchange rate).

[2] This variable remained significant ($p<.05$) in the full model.

*$p<.05$

**$p<.001$

constructs to be examined. We omitted 36 from the final regression model because they were collinear with the variables that were included. The remaining 37 variables were grouped into the seven categories listed in Table 1. A univariate linear regression approach was taken in examining all variables individually because the unstandardized beta coefficients generated by these analyses can be interpreted as the dollar costs associated with the variable concerned.

The seven categories of factors were then examined in a linear regression model to assess the amount that each category contributed to the variance in costs. The categories were then fitted to the model hierarchically, and variance was observed to identify how distinct from each other the categories were in their effects.

Results

Table 1 lists the 37 factors examined in the full regression model for their influence on health care consumption. For the physical health factors, we found that the presence of each diagnosis commonly found in veterans (high-risk diagnoses) added $31 to the fortnightly health care consumption cost per veteran ($p<.001$). Each low-risk diagnosis added $26 ($p<.001$).

Because the sample was concentrated in a narrow age range, the age variable was not significantly associated with reported health care consumption.

All the mental health variables except symptoms of alcohol dependence and abuse related individually to health care consumption. When the effects of other factors were not controlled, the presence of a clinical diagnosis of PTSD predicted an additional $79 of health care consumption per fortnight ($p<.001$). However, depression was the only mental health variable that continued to be significantly associated with health care consumption in the full model.

Of the variables predisposing a veteran to PTSD, educational difficulties were strongly associated with health care use, even after all other variables were controlled. Stressors not related to combat during deployment, such as the death of a parent, were also related to health care use in the univariate analysis, as were the attitudes of significant others toward the veteran's deployment.

Only one of the deployment variables was significantly related to health care consumption—the inten-

sity of the veteran's combat exposure (beta=$4.20, p<.05).

Among the repatriation variables, the one that stands out is whether veterans thought frequently of their Vietnam service (beta=$102, p<.001). Veterans' belief that they had been discriminated against because of their Vietnam service added $48 to the fortnightly service cost (p<.05). Having been involved in fights because of their veteran status added $30 (p<.05). Continuing anger about Vietnam added $24 (p<.05), and lack of welcome from significant others on return from Vietnam added $23 (p<.05).

Analyses of the next category of factors, membership in service-related groups, indicated that only membership in the Vietnam Veterans Association was associated with higher use of health care (beta=$16, p<.05).

The first R^2 column in Table 1 shows the variance accounted for by each category of variables when the category is considered individually. The other R^2 column shows the increase in variance when each category of factors is added sequentially to the model.

When examined individually, each category was found to explain at least 1 percent of the variance. Mental health variables explained the largest amount of variance (8 percent). If each of the categories is considered independently, we might look for a total effect of up to 23 percent of variance explained. In the full model, the overall R^2 of 16 percent indicates a significant overlap between the categories of factors.

Discussion and conclusions

These results demonstrate that health care consumption is related not only to the number of diagnoses that a person reports but also to his or her reported mental health status and social supports. Although lifetime alcohol abuse problems were detected in 74 percent of subjects, they were not related to reported health care consumption, contrary to what we expected based on the results of earlier clinical studies (7).

It appears that a proportion of the additional health care used by veterans with PTSD was at least nominally related to physical comorbidity. In previous studies, a strong relationship between PTSD and other symptom clusters has been reported (8,9). Consistent with these findings, we observed overlap between the effects of physical and mental health variables.

It might be suggested that the relationship between educational difficulties and higher health care consumption is mediated by intelligence. However, no relationship between health care consumption and lower intelligence scores was observed when the analysis controlled for physical health. Therefore, the observed effects of educational disadvantage may have been due to acquired information and learned skills rather than intellectual ability.

The strong association between health care consumption and the lack of welcome on homecoming from Vietnam, which added $11,732 to per-person health care costs in the 20 years since deployment, remained after the analysis controlled for mental health. So many years since the war, the strong relationship between higher health care consumption and veterans' perception of a lack of support from others emphasizes the importance of positive affirmation of veterans' service when they return.

This study demonstrates that the mental and physical health problems of Vietnam veterans and other peacekeeping veterans continue to warrant particular attention in their health care planning. The clear link between PTSD and a high level of health care consumption indicates the importance of prevention and effective management of this disorder (10). We also urge defense and repatriation authorities to give particular attention to social support factors relating to defense deployments. Further investment in prevention programs and deployment support appears to have significant potential for health outcomes and cost savings. ♦

Acknowledgments

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APPENDIX 6.1 - NOTES ON RETRIEVAL OF DATA FROM DVA AND HIC

This Appendix **aims** to record some key.comments on the results of the data extraction carried out for the thesis research by DVA and HIC. It also provides available indicators of the accuracy and completeness of subject identification and payment data extraction.

METHOD

Subjects

2000 in original random sample

1000 random sub-sample

641 respondents

50 known dead

Data

Interview data were available from the 641 interviewed subjects to provide self-report measure.

The total original sample of 2000 was supplied to DVA and HIC for data extraction for two reasons:

To provide a reserve of subjects within which apparent under-matching could be investigated without having to approach the subjects already in the AVVHS.

These investigations might include bias analysis in evaluating data retrieval.

To provide an additional level of protection of the identity of the 641 AHHVS subjects.

Data on benefits paid data were retrieved for the period July 1989 to June 1993 inclusive to cover the period from six months before the first interview to six months after the last interview. (See Figure 1 Chapter 6)

Procedure

DVA and HIC were approached in 1995 and 1997 respectively. This order occurred because it was originally considered possible that the relationships to be examined may be detectable within the DVA data alone. However, it soon became apparent that the share of healthcare provided to these veterans through HIC-administered programs was substantial.

Considerable negotiation was involved and some examples of correspondence with the agencies are provided in the attachments to this appendix. These attachments also outline the extraction procedures requested. However, to a large extent, both the subject matching and record extraction were iterative processes with several interactions and clarifications between the study investigators and departmental data managers.

Data coverage

As interviews had been conducted over a three year period, four years of HIC and DVA data on benefits paid were extracted covering the period from 1 July, 1989 to 30 June, 1993, that is, from six months before the first interview to six months after the last interview. (See figure 1 Chapter 6.) This ensured that for each subject, data on benefits paid were available for the six months periods before and after his interview date.

DVA data were filtered to exclude all but medical consultations.

Checking was carried out to exclude the possibility that duplicate records were included on payments once DVA and HIC data sets were combined.

For each subject, records were further eliminated for service dates which fell more than six months each side of the interview date.

Data were consolidated for each subject into a single record which totaled the payments for the 12-months medical services

RESULTS

Matching results obtained

16064 DVA occasions of service were extracted

DVA category	Services
Medical	12,043
Hospital	234
Domicilary Nursing	184
Dental	1,577
Allied Health	2,026

39112 HIC occasions of medical service were extracted

HIC records were found for 92.0% subjects

DVA records were found for 34.8% subjects (Department of Veterans' Affairs, 1995)

Unmatched subjects 5.1%

Subjects with medical services

4 year envelope	94.9%
1 year envelope	80.0%
2 week envelope	14.4%

CONCLUSION

Matching and extraction results were satisfactory in both the DVA and HIC data extractions.

APPENDIX 7.1 - MANUSCRIPT SUBMITTED[1] TO AUSTRALIAN AND NEW ZEALAND JOURNAL OF PSYCHIATRY –

[1]Currently in revision for resubmission as two papers after receipt of reviewers comments.

Post-traumatic Stress Disorder and Other Predictors of Medical Service Use by Vietnam Veterans

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Post-traumatic Stress Disorder and Other Predictors of Medical Service Use by Vietnam Veterans

Abstract

Objective:

To examine the relationship between post-traumatic stress disorder (PTSD) and medical care consumption by Vietnam veterans, and also to examine the validity of self-report medical care consumption as used in the Australian Bureau of Statistics Health Survey.

Method

We merged medical care consumption data from the Department of Veterans' Affairs and the Health Insurance Commission with self-report data from an epidemiological study of 641 Australian Vietnam veterans. PTSD and other factors were examined as predictors of medical care consumption using regression analysis. The merged self-report and objective measures of medical care consumption were then compared to test the validity and accuracy of the self-report measure.

Results

Major predictors of medical care consumption were age ($136 per year for each 5-years) and number of diagnoses reported ($81 to $112 per year for each diagnosis). Mental health factors such as depression ($14 per year for each symptom reported) and anxiety ($27 per year for each symptom reported) were also important predictors. We found that a diagnosis of post-traumatic stress disorder was associated with major medical costs ($140 per year) even though those costs were frequently for treatment of physical conditions.

Conclusions

Our findings indicate that, however incurred high health care and related economic and personal costs are associated with PTSD. This warrants continued efforts to identify and implement effective prevention and treatment programs. These findings also validated self-reported medical care consumption as a means of identifying higher and lower consumers. However, we found that subjects tended to project consumption from further back in time into the two-week reporting window. This has important implications for use of Australian Bureau of Statistics National Health Survey data as actual health care consumption may be overestimated by up to 50%.

Key Words

PTSD, Medical care consumption, Self-report validity.

Introduction

Service in war zones is known to be associated with elevated levels of morbidity in the veterans of those deployments (1; 2). In Vietnam veterans, post-traumatic stress disorder (PTSD) has been a particular focus of attention because it is a directly identified risk of combat exposure (3; 4). While these morbidity effects have been identified in many studies, there has been little systematic work to identify the health care costs of war service. In Australia, successive governments have acknowledged the special health needs of veterans by providing designated health care entitlements for veterans of war and other operational defence deployments. However, these benefits do not represent the actual cost of health care associated with the deployment, as the entitlements may include other health care costs and exclude some that are associated with deployment. Some veterans are entitled to receive all their health care from the services funded by the Department of Veterans' Affairs while others have only partial or no entitlement.

One approach to estimating the full cost of health care consumption is to use self-report data to examine health care consumption in relation to various health and psychosocial factors (5; 6). According to the self-report data from recent epidemiological surveys of Vietnam veterans, veterans are sicker than the general population (7; 8). However, they do not use more health services once their worse health state is controlled (9). Earlier analyses of self-reported healthcare consumption focused on post-traumatic stress disorder (PTSD) as a particular issue amongst veterans. It was found to be a major predictor of total health care consumption, along with depression and other mental health problems. Other psychosocial factors were found to be associated with health care consumption, including perceived social support and stressful experiences during the veterans' Vietnam deployment.

The earlier analyses of self-reported health care consumption have raised a number of questions including the effect of the short reporting period (two weeks), which was chosen to minimise recall bias and maximise recalled detail of the health services used. However, the short reporting period may give a distorted picture of service use over a longer period. For this reason, data on health care consumption over a longer period were sought. An approach was suggested by a limited amount of previous work in survey samples (10; 11). These studies had drawn on records of the Department of Veterans' Affairs (DVA) and the Health Insurance Commission (HIC) to examine actual medical service consumption.

We obtained the assistance of DVA and HIC in extracting data on benefits paid for subjects in the epidemiological study of Vietnam veterans reported previously (6). Unfortunately the HIC data represented only medical services used by the veterans. On the other hand, DVA data, although representing all services provided by DVA to entitled veterans, did not account for all services used by these veteran subjects as some were only partially or not entitled to DVA care. However, by combining DVA and HIC data it was possible to cover all medical services for which payments had been made, but not other health care services.

(Insert Figure 1 about here)

Figure 1 shows the relationship between the measure of self-reported health care consumption used in the earlier study and the medical care consumption measure used in this analysis. Self-report data covered all healthcare services for a period of only two weeks, whereas the medical benefits data covered the one-year period around the survey interview date, but non-medical services were excluded.

The use of the medical benefits data gives a means of checking whether the relationships found in the self-report data are robust by repeating the analysis with data objectively recorded over a longer time period on a key component of health service consumption. In the two-week self-report period, 86% of subjects reported some health care consumption even if only taking some medication. However, only 23% reported doctor consultations. By contrast, in the twelve-months' envelope, 80% used medical services for which some benefit was paid. This provided a more sensitive measure of medical care consumption when examining its relationship with other factors. Thus, while the two-week period was used in earlier analyses of self-reported total health care consumption to optimise the accuracy of recall, the twelve-month period was chosen for this analysis of medical care consumption as these were objective, reliable data and subject recall was not a problem.

Aims of the present study were to determine the relationship of medical service consumption to physical and mental health measures and, in particular, to PTSD. The study also aimed to ascertain whether aspects

of service in Vietnam are related to increased medical care consumption with health status and age controlled.

Method

Subjects

The Subjects examined in this study were 641 Vietnam veterans interviewed from a random sample of 1000 veterans. Of the 1000 subjects sampled, 213 could not be found, 50 were known to have died, 61 refused interview, and 35 were unable to be interviewed in the time available (12).

Measures

The data used in the analyses came from health and psychological state questionnaires. These were supplemented with Army personnel and psychological records that dated back to before the subjects' enlistment into the Defence Force.

Predictor variables

Predictor variables were examined in seven blocks of related measures. Variables were grouped into blocks on the basis of their relationship to the model described by the hypotheses. The first block contained age of the veteran at interview in 5-year intervals, because age is a known predictor of health service use (13). The next two blocks were for variables that measured current physical and mental health state. The next four blocks grouped variables that describe various aspects of pre-existing risk, exposure to health risks on deployment and finally the quality of the veterans' homecoming and repatriation after their deployment. The number of mental health variables included in the regression model was limited to those with minimal collinearity so that each of the factors relevant to health care consumption was covered as far as possible by only one measure.

Physical health *(2 variables)* was indicated by the number of diagnoses reported by subjects in the Australian Bureau of Statistics (ABS) National Health Survey questionnaire (5), excluding mental health conditions. The questionnaire used in the ABS survey was administered to the study subjects, as it is regularly used by Australian official surveys of health status and healthcare. The diagnoses reported were divided into two counts; conditions that are known to occur more frequently in veterans and those that do not (7).

Mental health *(15 variables)* was measured by a detailed clinical interview to diagnose PTSD cases (14), adapted for use with Australian veterans (AUSCID-V)(12); the National Institute of Health Diagnostic Interview Schedule (15); and self completion questionnaires including the Mississippi PTSD scale (16), the 28-item General Health Questionnaire (17), the Army Self Description Inventory (SDI) (18), the Centre for Epidemiologic Studies - Depression Scale (CES-D) (19), the Spielberger Trait Anxiety Inventory (20), and the Spanier Dyadic Adjustment Scale (21). Six of the fifteen variables examined from these measures were selected as of particular interest in relation to consumption of health care services. These were used for construction of the final regression model.

Predisposition risk *(22 variables)* indicator variables included:

personality attributes and attitudes prior and during the veteran's deployment which could make them vulnerable to stress related disorder or physical injury;

a propensity to hypochondria in their response to stressful experiences and symptoms, or an aggressive attitude that they are owed support by the community; and

interpersonal or social circumstances that could add to the stress of deployment or reduce their coping resources.

Demographic and historical health and psychosocial data were obtained from Army health and personnel records. Self-completed questionnaires provided retrospective information on military service experiences and post-service adjustment issues.

Deployment Profile *(14 variables)* encompasses variables describing the sorts of experiences the soldier had leading up to and during their deployment and how they reacted to them. Combat exposure was

measured with a 21-item questionnaire, developed by Wilson and Krauss (22), administered during the AUSCID interview.

The veterans' attitudes and adjustment during *(14 variables)* repatriation were measured by their self-report of:

how well they were supported and received;

opportunities that they had to readjust; and

whether they saw their deployment as having been a positive contributor to their personal status and achievements.

Membership of exservice organisations *(5 variables)* is similar in concept to the sixth block in that it has some bearing on the veterans' sense of positive identity. However, it is often suggested as being a major contributor to people's health care consumption through additional use of DVA services. The DVA, for example, has traditionally had a close relationship with the Returned and Services League (RSL) in its outreach endeavours and exservice organisations are major providers of veterans' advocacy.

The 37 variables, which were selected for the model, were chosen to minimise collinearity between variables used.

Dependent Variable

HIC and DVA extracted the health service consumption data according to a protocol, which involved privacy protection and maintaining de-identified linked data as the final product of the matching and extraction algorithm. The data were extracted for the four-year period surrounding the survey administration period. DVA and HIC data were merged and total benefits aggregated by subject for the six months periods before and after the survey interview dates.

Regression Models

A univariate linear regression approach was taken in examining the 37 selected variables individually and again after controlling for age and physical health. The effect of each of the 37 variables, with all fitted to the regression model, was then calculated.

The seven blocks of factors were then examined in a linear regression model to assess the effect of each block of variables, both individually and in combination with other blocks, as predictors of the subjects' medical care consumption. Blocks were fitted to the model paired with the physical health block, as well as hierarchically, and variance of alternative combinations was observed. This analysis identified which groups of factors were most highly related to medical care consumption, and to what extent the blocks of factors were distinct from each other in their effects.

Results

Univariate Regression of Individual Predictor Variables

(Insert Table 1 about here)

Each predictor variable was tested singly and after controlling for age, physical and mental health. Table 1 provides the results of these analyses. Age was found to be a strong predictor of health service consumption. Each five-year increase in age was associated with increased medical care consumption of $47 per annum ($p<0.001$). This effect was even greater once other variables were controlled, with each five-year age group increasing medical benefits payments by $137 per year ($p<0.001$). In the area of physical health, each physical diagnosis was associated with an increase in medical care consumption: $112 per year for diagnoses more prevalent in veterans and $81 per year for diagnoses not more prevalent in veterans ($p<0.001$). This relationship persisted when other variables were controlled.

Of the mental health variables, the presence of PTSD was found to have a major effect on medical care consumption, increasing it by $140 per year ($p<0.05$). However, this relationship lost statistical significance once physical and other mental problems were controlled. This may be because much of the medical care consumption related to PTSD is also related to physical health diagnoses. Depression and anxiety symptoms were also major predictors. Each point in the 0-20 scale derived from the CESD score was associated with an increased medical care consumption of $14 per annum ($p<0.001$). Each point on the

0-10 scale derived from the STAI anxiety score was associated with an increased medical care consumption of $27 per year ($p<0.001$). An important finding was the lack of association between a history of alcohol abuse and medical care consumption.

Of the predisposition factors, the only predeployment characteristic found to be associated with increased medical care consumption was the veteran's propensity to be a supporter of the war effort. Those veterans who were so disposed were found to be consuming $168 per annum more medical care ($p<0.05$). However, this relationship attenuated to insignificance when age and physical health were controlled. Veterans who were older at the start of their first tour were found to consume less medical care once current age, physical and mental health and other factors in the model were controlled. This is a strong relationship, with each year of age at the start of the first tour being associated with $36 per year less medical care consumption after all other variables of interest were controlled ($p<0.001$).

From the block of variables covering deployment profile, the combat index was found to predict a slightly higher consumption of medical care ($8.43 per year for each point on the 21-item scale, $p<0.05$). Time in the Army prior to Vietnam also predicted higher use of medical care ($9.80 per year, $p<0.05$). However, these relationships were attenuated after current age and physical health were controlled.

Of the repatriation variables, the veteran's own attitude to coming home was found to be related to medical care consumption. A positive attitude reduced use of medical care by $124 per annum for each point on the 2-point (0-2) index ($p<0.05$). After controlling for other factors, this relationship remained significant with each point being associated with a $93 per year reduction in medical care consumption ($p<0.05$). Thinking often about Vietnam was associated with an additional medical care cost of $225 per year ($p<0.001$). As in the analysis of self-report data (6), perceived lack of gladness of other people towards their return was also a predictor of increased medical care consumption. However, in contrast to this variable's association with self-reported total health care consumed, the relationship with medical care consumption disappeared once age, physical and mental health were controlled. Amongst the factors concerning exservice organisation membership, the strongest association was found to be with membership of the Vietnam Veterans Association (VVAA). Even after all other variables were controlled, membership of the VVAA was found to be associated with additional medical care cost of $75 per year for each point on the 0-2 scale ($p<0.001$).

Variance Analysis of Blocks of Factors

The results of this analysis are summarised in Table 2.

(Insert Table 2 about here)

The following blocks of factors explained a small but significant percentage of the variance: age (R^2=1.8%, df=1,$p<0.001$), physical health (R^2=9.0%, df=2, $p<0.001$), mental health (R^2=3.0%, df=6, $p<0.05$), deployment (R^2=2.5%, df=5, $p<0.05$), repatriation (R^2=3.6%, df=9, $p<0.05$) and exservice organisation membership (R^2=4.0%, df=4, $p<0.001$). With age, physical and mental health fitted to the model, the only other blocks adding significantly to R^2 were repatriation (R^2=2.6%, df=9, $p<0.05$) and exservice organisation membership (R^2=2.4%, df=4, $p<0.05$)

With all blocks fitted sequentially to the model, age first contributed 1.8% (df=1, $p<0.001$) to the total R^2 of 16.3% for the model. The largest contributor was the physical health indicator block, basically comprising variables that gave counts of the number of physical illness diagnoses reported (R^2 change=7.7%, df=2, $p<0.001$). The repatriation block 1.4% (df=9, $p<0.05$) and exservice organisation membership 2.2% (df=4, $p<0.05$) were also significant contributors. The R^2 change associated with the mental health block was attenuated in the full model.

Comparison of Self-report with Benefits Paid

Figure 2 summarises the comparison of actual benefits paid in the weekly periods before the interview for subjects who self-reported medical service consumption in the past two-weeks and those who reported no medical service consumption. Only 50% of those who self-reported medical service consumption in the past two weeks had actually used medical services (for which benefits were paid) in this period. However, almost 80% of this group had actually used medical services in the past 10 weeks. This compared to 30% actual use in the past ten weeks for those who reported no medical care consumption in the past two weeks.

Discussion

There were three major areas of outcome for this the study. Firstly, we determined the predictors of medical care consumption over a period of a year using objective rather than self-report of service consumption. Secondly, comparing self-report medical care consumption with benefits paid provided an indicator of the validity of self-report. Thirdly, the match extraction of the subjects' medical care consumption data replicated the success of other recent studies in retrieving these data reliably (11; 10).

As hypothesized, it was found that current age and physical health (diagnosed illnesses) were strong predictors of medical care consumption. As single variables, a number of mental health problems were also strong predictors of medical care consumption.

Particularly strong relationships were found between medical care consumption and a confirmed diagnosis of PTSD, and depression and anxiety symptoms. It must be recognized that these findings on PTSD are conservative, as they are linked purely to a clinically diagnosable level of PTSD. They do not therefore take into account the often seriously disabling levels of sub-clinical PTSD symptomatology often discussed in the literature. The cut-off used here was to ensure the most conservative diagnostic standard and to avoid the contentious current issues associated with an alleged trend to over-diagnosis. (23). This relationship between PTSD and medical care consumption was attenuated after physical health measures were controlled. A likely reason is that much of the medical care consumption associated with PTSD and other mental health factors is via increased treatment for physical diagnoses.

Veterans who were younger at deployment tended to be higher consumers of medical care, as were those with higher levels of combat exposure and length of time in the Army prior to deployment. The relationship with age at deployment remained strong in the full regression model, suggesting a real propensity for those who were young at deployment to use more medical care even after other health and social factors are controlled.

Repatriation factors associated with higher medical care consumption were self-perceived negative homecoming experience and membership of exservice organisations. However, these relationships disappeared after age and physical health effects were controlled suggesting that, as with PTSD, it may also have been largely related to medical care costs via presenting physical symptoms.

The lack of relationship between alcohol abuse and health care consumption that was observed with the self-report consumption data was also found with this medical care consumption data that covered a twelve-month period. This is a surprising finding, as previous research with clinical samples found that alcohol was associated with significant health care cost (24). The Garnick study and other recent studies on this topic (25; 26) relate to costs associated with treatment of alcohol abuse or costs of treating alcohol-related trauma. These findings do not dispute that large costs are incurred treating people for alcohol abuse or alcohol related problems. That has been empirically demonstrated, is widely accepted and has been the basis of much policy and social reform. Nevertheless, the lack of association between a history of alcohol abuse/dependence and current medical/health care consumption is a finding of this study and a similar New Zealand analysis using a population sample (27). It holds for both self-report of total health care consumption and the more objective benefits-paid measure.

The match-extraction of benefits paid data in relation to a sample of subjects who were randomly selected from the community was apparently very successful. Records were found for the majority of cases. In the four-year data envelope examined, only 40 of the 641 subjects interviewed had no records retrieved of benefits payment. The most likely explanation for these subjects is that they were non-users of medical consultation services during this period. Other explanations are that they were not correctly identified in the HIC or DVA client indexes. This level of inability to locate records is consistent with levels found in earlier studies of this type (e.g. (10; 11)).

The study provided data on the validity of self-reports over a 2-week period, as used in the ABS National Health Survey. The findings validated self-reported medical care consumption as a means of identifying higher and lower consumers. However, we found that subjects tended to project consumption from further back in time into the two-week reporting window. This has important implications for use of Australian Bureau of Statistics National Health Survey data as actual health care consumption may be overestimated by up to 50%.

It was found that about 49% of subjects appeared to be reporting health services as used in the two-week window that were actually consumed further back in time. Bradburn (28) and Groves (29) provide a more

comprehensive discussion of the 'telescoping' phenomenon observed in these findings. In addition to the observed telescoping effects, minor levels of discordance due to billing practices would be expected between accurate self-report medical care consumption and the data on benefits paid for those consultations by HIC and DVA.

As a scale measure of medical care consumed, self-report appears to be valid in that those who report more services were higher consumers. However, there appears to be up to 50% over-estimating of actual services used in the two-week reference period. Therefore, in estimating the actual rate of medical care consumption from self-report of recent use, a sensitivity discount factor of up to 50% needs to be applied to set a lower limit on the estimate. The parallel findings on predictors of health care consumption also confirm the validity of the scale generated by self-report when judged against the medical care benefits paid.

In conclusion, factors that were important predictors of medical care consumption were number of physical diagnoses, mental health conditions (particularly depression and PTSD), often thinking about Vietnam, quality of homecoming and membership of the Vietnam Veterans Association. There were differences in the psychosocial factors, which predicted consumption of medical care and self-reported total health care. This is consistent with findings of similar studies such as McCallum et al (13) and (11). Overall however, most predictors of total health care consumption were also consistent predictors of medical care consumption. Perhaps the most important finding was that while self-report proved to be a valid scale for level of consumption of medical care services, it tended to be a substantial over-estimate of the actual consumption of medical care. In relation to PTSD as the major focus of this study, we found that it was associated with substantial medical costs even though those costs were frequently related to treatment for physical presenting diagnoses. The health care cost alone that PTSD is clearly imposing on the community is very high. When we add to this the economic and personal costs, which must be associated with such pathology, continued efforts to identify and implement effective prevention and treatment programs for this extremely common disorder are well justified.

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Figure 1 Relationship between data on self-report of health care consumption and data on medical benefits paid

Table 1 Regression analysis of factors included in a model of predictors of medical care consumption by 641 Vietnam veterans

Predictors	High Score	Univariate Coefficient($)		Full Model Coefficient($)	
1. Age					
Age in 5 year intervals	Older	46.99	**	136.72	**
2. Physical Health					
Each veteran high risk diagnosis	Diagnoses	111.58	**	76.62	**
Each veteran low risk diagnosis	Diagnoses	80.92	**	53.42	**
3. Mental Health					
Level of depression (20 points)	Depressed	13.90	**		
Marital dysfunction (32 points)	Symptoms				
PTSD current diagnosis (0-1)	Present	140.19	*		
Total phobia symptoms (max 5)	Symptoms				
Lifetime alcohol symptoms (max 9)	Symptoms				
Level of anxiety (0-10)	Anxious	26.58	**		
4. Predisposition					
Measured intelligence level (scale 1-20)	Hi Intel				
Personality self orientation symptoms (max 7)	Symptoms				
Antisocial personality indicators (max 10)	Symptoms				
Personally reluctant to go to Vietnam (0-1)	Anti				
Significant others opposed deployment (max 3)	Anti				
Personally committed to Vietnam war (0-1)	Pro	167.79	*		
Felt ill-trained or prepared (0-1)	Problems				
Educational difficulties (0-3)	Problems				
Age at start of first deployment	Older			-35.93	**
Non-combat stressors during deployment (max 14)	Hi Stress	28.26	*		
5. Deployment Profile					
Deployed alone and not with a unit (0-1)	Alone				
Combat incident exposure (max 21)	Hi Combat	8.43	*		
Combat role of unit (max 13)	Hi Combat				
Disciplinary charges during service	More				
Years service experience pre-Vietnam	Longer	9.80	*		
6. Repatriation					
Pleasure in leaving Vietnam (max 2)	Positive	-124.16	*	-93.07	*
Amount talked about Vietnam 1st six mths (max 5)	More Talk				
Experience of discrimination over deployment (0-1)	Often				
Reluctance to reveal veteran status (max 4)	Often				

Arguments/fights over Vietnam involvement (max 2)	Often				
Often think about Vietnam (0-1)	Often	225.82	*		
Anger at others over Vietnam (max 2)	Often				
Shame over Vietnam service (0-1)	Often				
Gladness of others at return (0-6)	Not Glad	56.62	*		
7. Exservice Organisation Membership					
Active in Returned & Services League (max 2)	Active	67.01	*		
Active in Vietnam Veterans Association (max 2)	Active	96.67	**	75.13	**
Active unit association member (max 3)	Active				
Closeness with other veterans (max 7)	Closer				

$p<0.05$, ** $p<0.01$
(Only those coefficients where a significant relationship was detected were reported)
(Coefficients can be interpreted as $ medical care per year)

Table 2 Examination of model by reduction of variance of blocks of selected factors

	INDIVIDUALLY			CONTROLLING FOR AGE, PHYSICAL & MENTAL HEALTH			BLOCKS FITTED SEQUENTIALLY - FULL MODEL		
	DF	R^2	p VALUE	DF	R^2 chg	p VALUE	DF	R^2 chg	p VALUE
AGE	1	1.77%	0.0007				1	1.77%	0.0007
PHYSICAL	2	8.96%	0.0000				2	7.70%	0.0000
				9	10.63%	0.0000			
MENTAL	6	2.67%	0.0086				6	1.15%	0.2304
PREDISPOSTION	10	2.11%	0.1961	10	1.51%	0.3862	10	1.51%	0.3862
DEPLOYMENT	5	2.51%	0.0063	5	0.30%	0.8361	5	0.58%	0.5551
REPATRIATION	9	3.64%	0.0051	9	2.60%	0.0305	9	1.44%	0.0232
EXSERVICE	4	3.95%	0.0000	4	2.35%	0.0022	4	2.18%	0.0033
COLUMN TOTALS		*25.62%*			*17.37%*		*37*	*16.34%*	*0.0000*

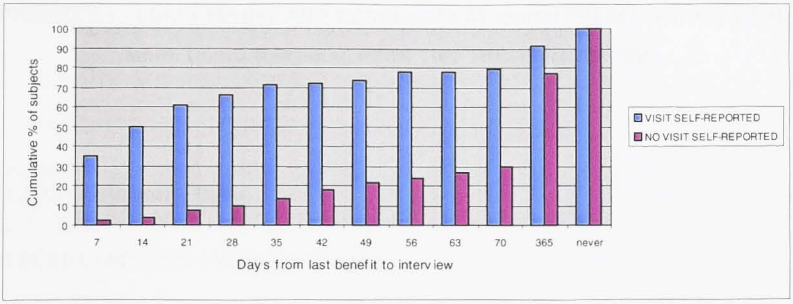

Figure 2. Comparison of medical care consumption in weeks before interview between those subjects who self-reported a medical service in the past two weeks with those who did not.

APPENDIX 8.1 - CONFERENCES AND WORKSHOPS AT WHICH PRESENTATIONS WERE MADE USING MATERIAL FROM THIS THESIS RESEARCH

1994 APS Conference - Perth

1995 PCSE Conference – Budapest Hungary

1997 Casemix Conference – Brisbane

1997-1999 National Health Information Management Group – including working group on specific disease registers

Nov 1997 NCEPH Presentation day

1998 Casemix Conference – Melbourne

1998 PCSE Conference – Manchester UK

1998-1999 Victorian Ambulance Clinical Information System Steering Committee

1999 National Health Information Management Advisory Council Meeting

1999 IT Infrastructure Workshop - Melbourne

1999 Casemix Conference – Darwin – including a presentation 'The Utility of Statistical Models for Predicting Future Consumption of Healthcare Resources in Victoria'

To

Kent Robert Marshall

20 August 1953 – 26 April 1954